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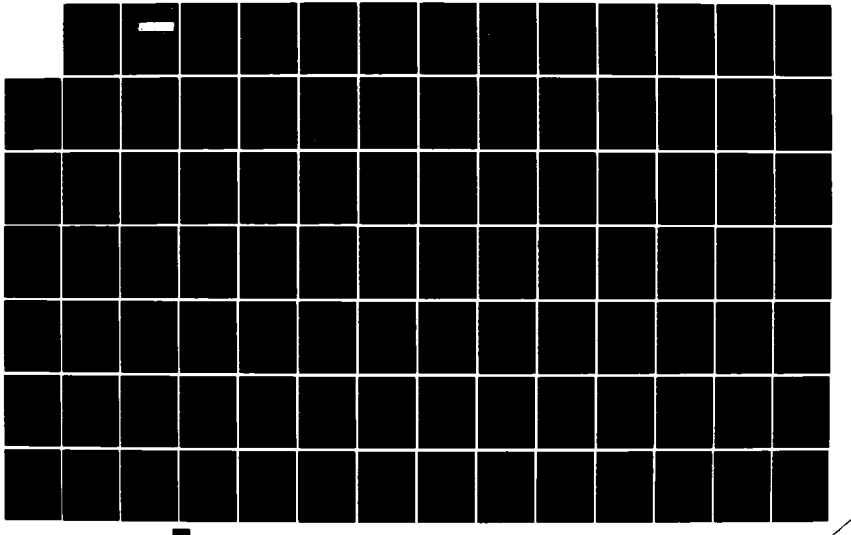

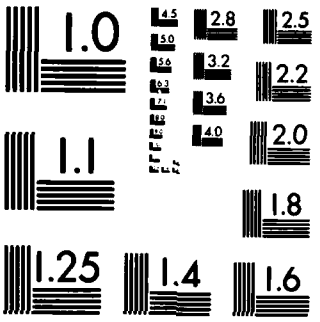

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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US Army Corps
of Engineers
Los Angeles District

telegraph canyon creek
City of Chula Vista

San Diego County, California

technical appendixes

Detailed Project Report for
Flood Control
and
Final Environmental
Impact Statement

July 1983

Volume II

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A150164	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Telegraph Canyon Creek City of Chula Vista San Diego County, California Detailed Project Report for Flood Control		5. TYPE OF REPORT & PERIOD COVERED Detailed Project Report Final- July 1983 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE July, 1983 13. NUMBER OF PAGES 450
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Los Angeles District, Corps of Engineers P.O. Box 2711, Los Angeles, CA 90053		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distrubution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

Copies are obtainable from the National Technical Information Service Springfield, VA 22151.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Flood Control Planning

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Telegraph Canyon Creek Basin is an elongated drainage area comprising about 4,800 acres, or 7.5 square miles, in San Diego County. It is located about 8 miles south of the City of San Diego. The creek flows through unincorporated County territory and the City of Chula Vista.

Because of the serious potential flood hazard to a highly developed area, the County of San Diego and the City of Chula Vista have sought aid to provide improvements along Telegraph Canyon Creek to protect the area.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

The selected plan would consit of (1) a 0.7 mile-long rectangular concrete-lined channel from a point about 500 feet upstream from 4th Avenue (near 3rd Avenue) to 0.3- miles upstream from Interstate 5; (2) a 0.3-mile-long section comprising double 10x12-foot boxes of covered channel connecting the rectangular channel to the existing 0.2-mile culvert under Interstate 5, which would be incorporated into the project; (3) a 0.3-mile-long concrete trapezoidal channel downstream from Interstate 5; and (4) a 0.1 mile-long earth-bottom trapezoidal channel leading into the San Diego Bay. This plan would provide protection from a 100-year flood. In Reach II there would be some bridge modificaitons and channel clearing. Construction of Reach I improvements is not dependent upon construction in Reach II.

The total cost of the selected plan in Reach I including study costs would be $5,390,000 (April 1983 price levels) with annual charges, not including study costs, of $394,000 and annual benefits equal to $430,000. The benefit-cost ratio would be 1.1.

TELEGRAPH CANYON CREEK

CITY OF CHULA VISTA

SAN DIEGO COUNTY, CALIFORNIA

DETAILED PROJECT REPORT FOR FLOOD CONTROL

AND

ENVIRONMENTAL IMPACT STATEMENT

VOLUME II

TECHNICAL APPENDIXES

JULY 1983

VOLUME II

TECHNICAL APPENDIXES

CONTENTS

APPENDIX A

PUBLIC VIEWS AND RESPONSES

United States Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
PACIFIC SOUTHWEST REGION
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:
H2219 (IAS-SF)

June 6, 1979

Col. Gwynn A. Teague
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
Post Office Box 2711
Los Angeles, CA 90053

Dear Col. Teague:

We have received copies of the two cultural resource reports prepared by Westec Services, Inc. entitled, "A Preliminary Archeological Reconnaissance for a Proposed Flood Control Project in the Lower San Luis Rey River Drainage" and "Archeological Test and Data Recovery Program at Telegraph Canyon, Chula Vista, California?. Review of these two reports has been completed and both are considered to be well-written and informative documents. We found no problems with the content of the Telegraph Canyon report, however, we have a few comments concerning the Lower San Luis Rey River Drainage report. Our comments are as follows:

Page 3 - Hours expended in the field total 113 hours, not 105 hours.

Page 23-24 - The survey methods do not adequatedly describe the type of coverage given the project area. The areas which proved to be inaccessible for survey purposes should have been more thoroughly discussed and those areas not examined should have been located on a map. The feasibility of surveying inaccessible areas after clearing of dense vegatation, as proposed for the located sites, should be considered. In addition, we have found that in the areas where vegatation is dense, making visual examination of the terrain difficult, survey members spaced at 40-60 meter intervals may be too far apart to locate small or obscured sites.

Page 41-42 - Item 7d of the Scope of Work states that the results of the survey should provide for "a reliable statement of the significance of the Cultural resources to be affected by the proposed project alternative".

On page 41 of the report it is stated that the contractor was unable on the basis of the preliminary survey data to assess the significance of the resources. Thus, an evaluation of the located resources per National Register critera should be an expressed purpose of further investigations. We agree it is premature to make recommendations concerning mitigation measures- i.e. preservation or salvage - until the resources have been evaluated for their eligibility for inclusion to the National Register of Historic Places.

We appreciate the opportunity to review and comment on these two reports. Should you have any questions concerning our review of these documents, please do not hesitate to contact this office at (415) 556-7741.

Sincerely yours,

Garland J. Gordon

Garland J. Gordon, Chief
Interagency Archeological Services
San Francisco

NO RESPONSE REQUIRED

COUNTY OF SAN DIEGO

COMMUNITY SERVICES AGENCY

Department of Sanitation & Flood Control (0380)

C. J. HOUSON
Director

County Operations Center, 5555 Overland Avenue, San Diego, California 92123 Telephone 565-5325

REF 3325

10 NOV 1978

District Engineer
Department of the Army
Los Angeles District, Corps
of Engineers
P. O. Box 2711
Los Angeles, CA 90053

SUBJECT: Telegraph Canyon Creek

We have reviewed the revisions to the information brochure for Telegraph Canyon Creek that your District currently has under preparation.

On 20 April 1976 the San Diego County Board of Supervisors provided you a Resolution of Intent to provide assurance of local cooperation for a future Federal Flood Control Project on Telegraph Canyon Creek in accordance with Plan M. A copy of the resolution is enclosed.

We believe that the refinements that have been made to Plan M in the latest information brochure further strengthens the Board's resolve to cooperate and support a Federal Flood Control Project on Telegraph Canyon Creek.

We appreciate your efforts to implement a Federal Flood Control Project in conformance to Plan M at the earliest possible date.

C. J. HOUSON

FAM:dt

cc: City of Chula Vista, P. O. Box 1087
Chula Vista, CA 92012, w/o enc.

Enclosure: Resolution

NO RESPONSE REQUIRED

United States Department of Agriculture
Soil Conservation Service
2828 Chiles Road
Davis, CA
95616

October 30, 1979

Gwynn A. Teague
Colonel, CE
District Engineer
Department of the Army
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Colonel Teague:

We acknowledge receipt of the Draft Detailed Project Report for Flood Control and Draft Environmental Impact Statement for Telegraph Canyon Creek, City of Chula Vista, San Diego County, California. This document adequately describes the impact the proposed project will have upon the stream channel riparian habitat. It also adequately describes the impact the proposed project will have upon the southern part of the J Street Marsh.

Review of this document reveals no adverse impacts upon any other concerns of the Soil Conservation Service. No prime agricultural land will be affected. No agricultural water resource will be lost because of project action.

We appreciate the opportunity to review and comment on this study.

Sincerely,

FRANCIS C. H. LUM
State Conservationist

cc: Norman A. Berg, Administrator, USDA, SCS, Washington, D. C.
Director, Office of Federal Activities (Mail Code A-104),
Environmental Protection Agency, Room 537 West Tower,
Waterside Mall S. W., Washington, D. C. 20460

No response required

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION NINE

Two Embarcadero Center, Suite 530
San Francisco, California 94111

ARIZONA
CALIFORNIA
NEVADA
HAWAII
GUAM
AMERICAN SAMOA

November 15, 1979

IN REPLY REFER TO
HED-09

Colonel Gwynn A. Teague
Los Angeles District Engineer
U. S. Army Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Colonel Teague:

We have reviewed the Draft Environmental Impact Statement and Detailed Project Report for Telegraph Canyon Creek, San Diego County, California, and have no specific comments to offer.

We appreciate this opportunity to review the subject Draft Statement.

Sincerely yours,

Neil Dillabough, Director
Office of Environment and Design

No response required.

mtdb Metropolitan Transit Development Board
620 "C" Street, Suite 400, San Diego, California 92101 (714) 231-1466

November 26, 1979

Mr. Dee Gonzales
Project Manager
Corps of Engineers
P.O. Box 2711
Los Angeles, CA. 90053

Dear Mr. Gonzales:

The Federal Rail Administration forwarded your Draft Environmental Impact Statement for Improvements on Telegraph Canyon Creek in San Diego County California to us for comment since the project crosses the San Diego and Arizona Eastern Railway which we recently purchased.

Since the project would probably provide favorable impacts on our operations we offer no comments. However we request that if detailed design is commenced we be contacted to coordinate suitable connections to our facilities.

Sincerely,

Roger N. Clark
Director of Engineering

cc: Jinx Kuehn
Flake Willis, SDGAE

RNC/lsd

No response required

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WESTERN REGION
P O BOX 92007 WORLDWAY POSTAL CENTER
LOS ANGELES CALIFORNIA 90009

December 4, 1979

Mr. Dee Gonzales, Project Manager
U. S. Corps of Engineers
Los Angeles District
P. O. Box 2711
Los Angeles, California 90053

Dear Mr. Gonzales:

As requested, we have now completed the review of your Draft Detailed Project Report for the Telegraph Canyon Creek Project located in San Diego County, California.

Please be advised that our preliminary findings indicate that this proposed project will not present any problem to any existing or presently planned FAA facilities. However, it is advised that the Corps of Engineers is required to file a notice with the Federal Aviation Administration for this project if determined applicable and as stipulated under Part 77 of the Federal Aviation Regulations (FARs).

We appreciate the courtesy extended in bringing this matter to our attention.

Sincerely,

W. BRUCE CHAMBERS
Regional Planning Officer

No response required.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
2500 WILSHIRE BOULEVARD, LOS ANGELES, CALIFORNIA 90057

REGION IX
450 Golden Gate Avenue
P.O. Box 36003
San Francisco, California 94102

December 5, 1979

IN REPLY REFER TO:
9.2SS

Mr. Norman Arno
Chief, Engineering Division
Department of the Army
Los Angeles District Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Mr. Arno:

Subject: Draft Environmental Impact Statement
Telegraph Canyon Creek Improvement
Chula Vista, California

HUD financial assistance in the form of Community Development Block Grant funds are being expended in the City of Chula Vista.

Based on our review, CDBG funds are not presently being expended in the Census Tracts bisected by Telegraph Creek. However, as Telegraph Creek does cross through several existing residential neighborhoods, where potential housing sites exist, the appropriate officials of the City should be consulted in your decision making process with regard to floodplain, land planning and zoning requirements on the subject project.

Thank you for informing us of this project proposal.

Sincerely,

J.P. Sabella
Acting Area Manager

No response required.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL DATA AND INFORMATION SERVICE
Washington DC 20235
Center for Environmental Assessment Services

Rec'd PP/EC
12 DEC 1979

December 11, 1979 OA:D24:NDS

TO: PP/EC - R. Lehman

FROM: OA/D24 - N. Strommen

SUBJECT: DEIS 7912.01 - Telegraph Canyon Creek - City of Chula Vista; San Diego County, California

Specific Comment:

Volume II, Page E-5, Paragraph b., last sentence, should be changed to read: "Both sets of data are based upon the 30 year means for the period 1941-1970, the period used by the Weather Service to compute it's current climatic normals."

Page E-5 has been changed as noted.

(RF: N. Strommen, D24)

Attachment - DEIS 7912.01

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814
(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources
Department of Forestry

EDMUND G BROWN JR
GOVERNOR OF
CALIFORNIA

Air Resources Board
Colorado River Board
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Lands Commission
State Reclamation Board
State Water Resources Control Board
Regional Water Quality Control Boards
Energy Resources Conservation and Development Commission
California Coastal Commission
California Conservation Corps
State Coastal Conservancy

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

1979 DEC 14

U. S. Army Corps of Engineers
Post Office Box 2711
Los Angeles, CA 90053

Attention: Dee Gonzales

The State of California has reviewed the Telegraph Canyon Creek, City of Chula Vista, San Diego County, California, Main Report, Vol. 1, September 1979, and the Technical Appendixes, Detailed Project Report for Flood Control and Draft Environmental Impact Statement, Vol. II, September 1979, submitted through the Office of Planning and Research (State Clearinghouse) in the Governor's Office.

The Department of Fish and Game has the following comments:

> "We fully support the Corps of Engineers intention to include and implement the measures outlined in the U. S. Fish and Wildlife Service letter of January 25, 1979, as contained in Appendix H of the document. We believe these measures will provide protection of the endangered light-footed clapper rail, the California least tern, and the ecological integrity of the J Street Marsh and marine environment of San Diego Bay.
>
> "However, we are concerned that storm runoff entering the J Street Marsh would be confined to a narrower channel than currently exists. This could result in scouring a deeper channel through the marsh thus causing an increased sediment load with resultant deposition within the marsh and San Diego Bay. For our full concurrence of the project we request that an impact assessment report describing the potential impacts of increased sediments upon the marsh ecosystem and marine environment be provided in an amended EIS for our review and comment. This assessment should also include effective mitigation measures to offset potential impacts that may be identified in the document."

The concerns expressed by the Resources Agency have been addressed under response to the Department of Interior letter of comment. Additional information on exit velocities, sedimentation, and operation and maintenance in the intertidal reach have been incorporated into chapter 4. Also see 12 March 1980 letter from U.S. Fish and Wildlife Service in Appendix H.

The State Water Resources Control Board, through the California Regional Water Quality Control Board, San Diego Region, has the following comments:

> "The document states that dewatering will be required in order to excavate and construct the proposed improvements below station 40+00 (Volume II, p. F-20).
>
> "Please contact Mr. Arthur Coe at the San Diego Regional Board to determine if waste discharge requirements will be needed for the discharge from project dewatering."

The State's review, which fulfills the requirements of Part II of Office of Management and Budget Circular A-95 and the National Environmental Policy Act of 1969, was coordinated with the Departments of Water Resources, Conservation, Fish and Game, Food and Agriculture, Health Services, and Parks and Recreation; the Air Resources, the State Water Resources Control, and the Solid Waste Management Boards; and the State Lands Commission.

We appreciate having been given the opportunity to review these documents.

Sincerely,

James W Burns

JAMES W. BURNS
Assistant Secretary for Resources

cc: Director of Management Systems
State Clearinghouse
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH 79110109E)

The Corps has informed the San Diego Regional Board that waste discharge requirements will not be needed for the discharge from project dewatering.

FEDERAL ENERGY REGULATORY COMMISSION
REGIONAL OFFICE
555 BATTERY STREET, ROOM 415
SAN FRANCISCO, CA 94111

December 18, 1979

Colonel Gwynn A. Teague
District Engineer
Los Angeles District
U.S. Army Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Colonel Teague:

This is in response to your letter, received in this office on October 25, 1979, requesting our comments on your Draft Detailed Project Report for Flood Control and Draft Environmental Impact Statement for Telegraph Canyon Creek in San Diego County, California, dated September 1979.

We have reviewed your draft report to determine the effect on matters affecting the Federal Energy Regulatory Commission's responsibilities. Such responsibilities relate to the licensing of non-federal hydro-electric projects and associated transmission lines, certification for construction and operation of natural gas pipeline facilities, defined to include both interstate pipeline and terminal facilities; and the permission and approval required for the abandonment of natural gas pipeline facilities.

Our review indicates there would not be any significant impacts in those areas of concern nor serious conflicts with this agency's responsibilities if this plan were adopted.

Sincerely,

Eugene Neblett
Regional Engineer

No response required.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
PACIFIC SOUTHWEST REGION
BOX 36096 · 450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102
(415) 556-8200

ER-79/1065 December 18, 1979

District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

The Department of the Interior has reviewed the draft detailed project report and draft environmental statement for Telegraph Canyon Creek, San Diego County, California, and offers the following comments.

DRAFT ENVIRONMENTAL STATEMENT

General Comments

The document is inaccurate in its presentation of the U. S. Fish and Wildlife Service position concerning this project, deficient in discussing adverse environmental impacts associated with this project, and neglects to include a section discussing what mitigation measures will be implemented to offset the adverse environmental impacts.

We suggest that mitigation measures be proposed to preserve or protect any cultural resources that may be unearthed during construction. In the event that archeological resources are discovered, a qualified archeologist should be called to the site to perform professional data recovery studies which may include site mapping, artifact collection, excavation, analysis, and report preparation in consultation with the State Historic Preservation Office. The archeologist may determine that work should be temporarily stopped or that the project should be altered in order to preserve or protect archeological resources discovered. Although the cultural resources survey indicates that construction of the proposed project should not endanger cultural resources, mitigation measures should be proposed. Furthermore, comments received from the State Historic Preservation Office and the Interagency Archeological Service on the cultural resources survey should be included in the final statement.

The final statement should clearly state that the proposed project will not involve the taking of any land now used for public recreation. In the case of the Rice School, land to be taken for the proposed project is now being used for flood control and is not used for recreational

General comments, par. 2: Should any cultural resources be unearthed during construction, a qualified archeologist will perform professional data recovery studies as noted in review comment. These efforts would be coordinated with the State Historic Preservation Officer. This information has been added to paragraph 4.19. The 6 June 1979 letter from the Heritage Conservation and Recreation Service, Pacific Southwest Region, is included in appendix A. A copy of the 7 March 1980 letter to the State Historic Preservation officer is also included in Appendix A.

General Comments, par. 3: No lands now used for formal recreation will be required for the proposed project. This has been noted in paragraph 4.23.

purposes. We concur with the conclusion of the project sponsor that incorporation of recreational opportunities (bike trail) is not feasible in the proposed project.

Specific Comments

Section 4.15, page 128. It is stated that the Corps of Engineers will implement the conditions outlined in the Fish and Wildlife Service's January 25, 1979, biological opinion to insure the proposed project will not jeopardize either the California least tern or the light-footed clapper rail. Section 6, pages 149-150, "Selection of Disposal Sites for Dredged Material" c. (1) further states that the FWS letter of May 14, 1979, anticipates long-term positive impacts between Interstate 5 and the existing marsh if the project is implemented according to agreed-upon project conditions. However, the document does not mention that FWS comments on this project were based upon a different set of project conditions than have been revealed therein, and in recent CE correspondence. Our prior understanding of the agreed-upon project conditions was as follows:

The project would:

1. Not proceed beyond the 5-foot contour;
2. Result in approximately a 6 foot per second channel velocity (aided by a drop structure and stabilizer);
3. Result in increased and undisturbed salt marsh and mudflat;
4. Not adversely impact the existing salt marsh and mudflat;
5. Not scour out or deposit heavy loads of sediment in the marsh;
6. Minimize the size of the channel opening into the marsh;
7. Not grout the rock riprap leading to the channel opening.

The project now proposed in the EIS and in subsequent CE correspondence to the FWS is one which will:

1. Encroach to the 4-foot contour to reduce channel exit velocities from 9.2 to 7.6 feet per second (letter to the FWS dated October 9, 1979). This is the first indication that channel velocities are of this magnitude, and necessitate reduction to reduce anticipated scouring in the marsh. Previous coordination with the FWS indicated exit velocities would be about 6 cubic feet per second. The magnitude of scouring is confirmed in Section 4.13 of the EIS;

2. Subject area between Interstate 5 and the existing marsh to "periodic maintenance operation." This is confirmed in Section 4.11 of the EIS.

General Response, page 2: The U.S. Fish and Wildlife Service was informed of the proposed project modification in a timely manner. The Corps regrets that the proposed extension of the project to the 4-foot contour line, which was incorporated into the project to reduce the exit velocity and thus reduce project-related impacts on the marsh, was not noted in the draft environmental impact statement. A meeting was held at the F&WS field office, Laguna Niguel, to clarify the misunderstanding regarding exit velocities and to discuss the effects of the modified velocity on the marsh. The F&WS was advised that the existing velocity at the exit is calculated to be 9.6 feet per second. Under the original project design, the velocity at the same point would be 9.2 fps, whereas under the modified project condition it would be reduced to 7.6 fps. It was pointed out that the velocity calculated over the entire reach averages about 6 fps under both present and project condition.

The very limited project maintenance in the intertidal reach and the reduction in velocity at the mouth made possible by the project modification should ensure that the project will not adversely affect endangered species utilizing J Street Marsh (see F&WS letter of 12 March 1980 in Appendix A).

The project, as proposed in the subject document, reveals potential adverse impacts to the marsh associated with accelerated erosion, deposition, and periodic maintenance operations. It is obvious that the biological opinion of January 25, 1979, no longer applies to this changed design. Any material included on potential impacts on California least tern and light-footed clapper rail would have to be based on a further consultation.

We believe the EIS should:

1. Greatly expand on and detail the extent of the expected erosion, deposition, and maintenance activities in the area between Interstate 5 and the existing marsh;

2. Modify or delete the section referring to previous FWS comments, which were based on a different set of project conditions than now exist;

3. Incorporate comments in the text that establish the fact that the FWS believes the project as now proposed could result in significant adverse impacts on the marsh unless the project conditions return to what they were previously;

4. Expand the section entitled, "Adverse Environmental Effect Which Cannot Be Avoided" to include the environmental effects concerning wildlife resources. This section should include the following statements:

(a) This project will permanently destroy the majority of the viable wildlife habitat existing within the proposed channel alignment;
(b) This project will result in permanent degradation of the salt marsh by:
(1) significantly accelerating the rate of scouring in the salt marsh;
(2) significantly accelerating the distribution and deposition of sediments on established salt marsh vegetation;
(3) periodic removal of salt marsh and other buffer vegetation between Interstate 5 and the existing marsh. Section 5.01 d. should indicate exactly where these three acres of land are located.

A section should be added following the revised Section 5.01 which clearly details mitigation measures to be implemented to offset each of the adverse impacts described in these comments.

Specific Comments:

Page 3, No. 1. The area downstream from Interstate 805 is nearly fully urbanized, but lands above Interstate 805 are presently mainly agricultural. Plate 8 in appendix E (Urbanization--Land Use; 1990 General Plan) indicates partial urbanization of the project drainage area above Interstate 805 by 1990. Runoff from the primarily urban portions of the drainage area does not carry much sediment, and as urbanization extends upstream from Interstate 805, the percentage of "clean" runoff, that is runoff lacking in sediments, should increase. As noted in paragraph 4.11 in the DEIS, no significant changes in sediment deposition or turbidity will be caused by the proposed action. This applies with the project modification as well.

Reducing the exit velocity from 9.2 fps to 7.6 should reduce scour of the J Street marsh during high discharge. The maintenance program downstream from Interstate 5 (in the earth-bottom portion of the channel) should be beneficial in controlling erosion resulting from storm runoff. Trees and large shrubs will have to be removed from the channel in the reach downstream from I-5. No heavy equipment will be allowed in the channel or channel mouth in the intertidal area; removal will be selective and by hand labor. Marsh vegetation (e.g., pickleweed, cordgrass) will not be removed. Under normal conditions, no maintenance will be necessary in the intertidal area, but, as noted above, if any trees or shrubs should grow in this reach they would be removed by hand. Within the rest of the earth-bottom channel upstream to Interstate 5, grasses and such flexible vegetation as cattail and bulrush will be allowed to grow. The F&WS, by mutual agreement with the San Diego County Flood Control District, may review the operation and maintenance manual for the project.

Page 3, No. 2. Reference to previous F&WS comments has been deleted from the report.

Page 3, No. 3. As noted under general response, the modification was incorporated into the plan to reduce impacts on the marsh. The new design reduces velocity at the mouth from 9.2 fps to 7.6 fps.

(additional response on next page)

Although the FWS has had involvement with this project, the concerns raised herein are the result of changes and/or refinements in the project by the Corps of Engineers. The FWS welcomes in-depth coordination efforts and resolution of problems. We are hopeful that diligent CE coordination efforts will help resolve many project-associated difficulties.

DRAFT DETAILED PROJECT REPORT

Specific Comment

Page 99. It is stated that the data in the EIS was used in the determination of a selected plan. Since this data was based on previous understandings on project design and seriously underestimated the environmental hazards, we do not believe adequate consideration could have been given to ways to avoid or mitigate these damages. We believe further consideration and coordination with the Fish and Wildlife Service is needed before this plan is forwarded to higher authority.

We also do not believe the plan in its present form meets the intent of the Executive Orders on Flood Plains and Wetlands since there is a potential for significant encroachment or degradation of these resources. Rather than encouraging continued use and future development in the floodplain, the plan should include effective zoning by the city of Chula Vista and the county of San Diego to limit growth and new development on the floodplain.

Thank you for the opportunity to comment on these documents. If you have any questions on these comments, please contact me directly.

Sincerely,

Patricia S Port

Patricia Sanderson Port
Regional Environmental Officer

Page 3, No. 4.

(a) Vegetation will be allowed to reestablish along the earth-bottom channel downstream from Interstate 5 subject to the maintenance conditions outlined under response for page 3, No. 1. (Also see b(3) below.) No marsh vegetation will be removed during limited maintenance operations.

(b) The following are in response to comments on the salt marsh:

(1) Scouring will be reduced as noted in general response.

(2) No significant changes in sediment deposition are anticipated as a result of the proposed action.

(3) Trees and large shrubs will be removed from the earth-bottom channel reach but salt marsh vegetation, grasses, and other flexible vegetation will be allowed to reestablish. Of the 12 acres of vegetation that will be destroyed during the construction process, 3 acres will be allowed to revegetate. This acreage consists of the earth-bottom channel from Interstate 5 to the channel mouth (see par. 4.12 in the DEIS). The other 9 acres consists of the concrete channel area in the project reach upstream from Interstate 5.

Page 3, final paragraph. The mitigation program for the project includes: timing of construction to avoid impacts on endangered species; preventing construction work or machinery to encroach bayward of the 4-foot contour; implementing measures to ensure that abnormal pollution and siltation of the marsh do not occur; and the maintenance program outlined in response for page 3, No. 1.

Page 4, comment concerning page 99 of draft DPR. Further coordination has taken place to clarify misunderstandings related to the project design and the modification. The Corps believes that the modified plan, by reducing anticipated impacts in the marsh, meets the intent of the Executive Order on Wetlands. By incorporating a study of nonstructural solutions into the planning process, the proposed project is also in compliance with the Executive Order on Flood Plains

cc: Director, OEPR (w/copy incoming)
Director, Heritage Conservation & Recreation Service
Director, National Park Service
Director, Fish and Wildlife Service
Director, Geological Survey
Director, Bureau of Land Management
Director, Bureau of Mines
Director, Water and Power Resources Service
Commissioner, Bureau of Indian Affairs
Reg. Dir., HCRS
Reg. Dir., BLM
Reg. Dir., NPS
Reg. Dir., FWS
Reg. Dir., GS
Reg. Dir., BM
Reg. Dir., WPRS
SHPO

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D C 20230
(202) 377-4335

December 31, 1979

District Engineer
U.S. Army Corps of Engineers,
Los Angeles District,
P.O. Box 2711
Los Angeles, California 90053

Dear Sir:

This is in reference to your draft Environmental Impact Statement entitled, "Telegraph Canyon Creek, Chula Vista, California." The enclosed comment from the National Oceanic and Atmospheric Administration is forwarded for your consideration.

No response required.

Thank you for giving us an opportunity to provide this comment, which we hope will be of assistance to you. We would appreciate receiving seven copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure: Memo from:
NOAA-Environmental Data and Information Service-N. Strommen

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Project #D-COE-K36036

Gwynn A. Teague
Colonel, CE
District Engineer
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles CA 90053

31 JAN 1980

Dear Colonel Teague:

The Environmental Protection Agency (EPA) has received and reviewed the Draft Environmental Impact Statement (DEIS) titled Telegraph Canyon Creek, City of Chula Vista. The EPA's comments on the DEIS have been classified as category LO-1. Definitions of the categories are provided on the enclosure. The classification and the date of the EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal Actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the pro- posed action and the adequacy of the environmental statement.

The EPA appreciates the opportunity to comment on this DEIS and requests three copies of the Final Environmental Impact Statement when available.

If you have any questions regarding our comments, please contact Susan Sakaki, Acting EIS Coordinator, at (415)556-6925.

Sincerely yours,

Paul C. Schmidt

Paul De Falco, Jr.
Regional Administrator

Enclosure:

EIS CATEGORY CODES

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

Water Comment

The EPA recommends the utilization of "Best management Practices Guidance, Discharge of Dreged or Fill Materials" (EPA 440/3-79-028, September 1979) with respect to mitigating potential adverse impacts on water quality resulting from the proposed project. The Final EIS should indicate consideration of these Best Management Practices.

The Corps has obtained a copy of this report from EPA and will consider these Best Management Practices in implementating the proposed project.

SPLED-EP

7 March 1980

Dr. Knox Mellon
State Historic Preservation Office
P.O. Box 2390
Sacramento, California 95811

Dear Dr. Mellon:

Inclosed for your review and comment are copies of two cultural resource reports entitled "Archaeological Test and Data Recovery Program at Telegraph Canyon, Chula Vista, California," and "A Preliminary Archaeological Reconnaissance for a Proposed Flood Control Project in the Lower San Luis Rey River Drainage." These reports were originally submitted to your office for review and comment on 3 April 1979, but comments have not been received to date.

The Telegraph Canyon report provides the results of a limited control test and data recovery project performed by Westec Services, Inc., San Diego, California, under contract to the US Army Corps of Engineers, Los Angeles District. This project was designed to provide information regarding cultural resources within a proposed flood control project located on properties adjacent to Telegraph Canyon Creek. This area comprised the mouth of the canyon in San Diego Bay to 1,800 feet inland. The results of the testing proved negative. No cultural values of either the archeological or historical past were encountered. Should cultural values be encountered during construction, all suitable measures will be taken to ensure their integrity until a qualified professional has assessed the situation and comments from appropriate agencies have been received.

The report entitled "A Preliminary Archeological Reconnaissance for a Proposed Flood Control Project in the Lower San Luis Rey River Drainage" was also prepared for our office by Westec Services, Inc. This report details a field survey conducted within the Lower San Luis Rey River in northern San Diego County. This survey was conducted to assess the location and values of cultural resources within a proposed dredging and channel improvement project in a portion of the river from the Pacific Ocean to a point 7 miles upstream.

SPLED-EP

7 March 1980

Dr. Knox Mellon

This project provided positive results. Twelve isolated locales of prehistoric debris, eight prehistoric sites, and two historic adobes were encountered. Measures of protection, preservation, and/or mitigation of any cultural resources that will be adversely impacted by the Corps' proposed San Luis Rey River project will be proposed and coordinated with the proper agencies to ensure that local, State, and Federal guidelines concerning these cultural resources are met adequately.

Please review the inclosed reports and forward your views by 30 March 1980. Your comments are needed for inclusion in the final environmental impact statement for the Telegraph Canyon Creek project and the draft environmental impact statement for the San Luis Rey River project. If we do not receive your comments by 30 March, the District will conclude that your office concurs with the findings in these two cultural resource reports. If you require any additional information, please contact Ms. Patricia Martz at (213) 688-5421.

Sincerely,

2 Incl
As stated

GWYNN A. TEAGUE
Colonel, CE
District Engineer

NO RESPONSE REQUIRED

STATE OF CALIFORNIA — EDMUND G. BROWN JR., GOVERNOR

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

6154 Mission Gorge Road
(Mail: Suite 205/Enter: Suite 10b)
San Diego, California 92120
Telephone: (714) 265-5114

April 8, 1980

U.S. Army Corps of Engineers
Environmental Planning Section
P. O. Box 2711
Los Angeles, California 90053

Attention: Laura Tschude

Gentlemen:

Re: Telegraph Canyon Creek Flood Control Project

We have reviewed the project as described in the draft EIS dated September 1979. Based on the information in the draft EIS, it appears that the completed project will not result in a discharge of wastes to navigable waters. Therefore, certification would not be necessary and we recommend that you not submit a formal application for certification of conformance with water quality standards for the completed project.

If channel construction activities associated with the project involve dewatering and a resulting discharge to navigable waters, a NPDES Permit may be required. We suggest you contact us approximately six months in advance of the estimated start of construction for further information in this regard. In the meantime, please contact me at the above number if you have any questions.

Very truly yours,

ARTHUR L. COE
Senior Engineer

NO RESPONSE REQUIRED

APPENDIX B

PROBLEM IDENTIFICATION

(Existing Condition Data)

APPENDIX B

PROBLEM IDENTIFICATION
(Existing Condition Data)

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TABLES

APPENDIX B

PROBLEM IDENTIFICATION

(Existing Condition Data)

The following data on Problem Identification are also discussed in the Main Report.

EMPLOYMENT

Employment forecasts for the period 1979 to 1984, which can be used as an indicator of the economic base of the region, suggest that wholesale and retail trade will experience the largest growth rate, followed by service employment and manufacturing in that order. The remaining major employment sectors are projected to grow steadily until 1984. A possible exception might be the construction industry, which might realize a net decline in employment. Although the rest of these remaining major employment sectors are expected to grow, their growth rate will lag behind the region's population growth. Therefore, they will all experience a decline in their respective shares of total employment.

Table B-1 presents historical and projected employment for San Diego County by type. The historical information is from the Bureau of Census; the projections are based on the Comprehensive Planning Organization (CPO) projections of employment population ratios adjusted to Department of Finance population projections. Reflecting steady growth in almost all major industries, employment in San Diego County grew at an average rate of 3.7 percent per year in the sixties. Given current population and industry trends, total employment should increase from 638,800 in 1980 to 864,100 in 1990. The projected growth of civilian employment between 1977 and 1984 is 606,800 in 1977 and 748,100 in 1984. This reflects an average annual growth rate of 3.3 percent. However, employment is expected to grow at 5.1 percent in 1977 and then level off to 2.6 percent by 1981. Local businessmen and planners are aware that such growth must proceed in an orderly fashion. In the past, announcements of new job opportunities brought a rush of would-be employees from other areas of the State, thereby keeping the unemployment rate up despite growth in local employment. In the future, local policies will attempt to temper such population influxes by controlling land use and construction permits. Government (including the military), manufacturing, trade, and services (including tourism), will continue as the major employment sectors in San Diego. Since 1960, however, the relative importance of these sectors has shifted. The government sector, second to total manufacturing in terms of employment in 1960, has become the largest employer in San Diego. This dominance by the public sector, which is characteristic of the entire State, reflects a large military population and rising need for public services throughout the country. This category includes employment by the Federal, State, county, and city governments, as well as special districts (e.g., flood control) and State and local education components.

Government, although currently the major employer in the region, will yield to retail and wholesale trade as the leading employer by 1983. The retail trade sector alone will account for approximately 85 percent of over 150,000 new jobs by 1984. The projected rapid growth of trade employment is expected to result primarily from regional growth of population and income.

The manufacturing sector, once predominantly aerospace, has achieved a slightly more stable employment base. Electronics, data processing, and small manufacturing will be hiring increasing numbers of workers in the seventies. However, the continued dependence of this sector on both aerospace and defense contracts makes this category of employment difficult to forecast accurately. San Diego's newer industries such as oceanic research and development health science will also show increased activity. In addition, San Diego is developing major retail outlets and gaining recognition as a potential center for corporate headquarters facilities.

Although as many as 140,000 new jobs are expected to be added between 1977 and 1984, the attractiveness of the San Diego region as a place to live will probably result in high immigration and a surplus in the labor marker. Because the current definitions of unemployment are being modified, it is difficult to assign a current or even a projected unemployment rate to the region. However, most authorities foresee a regional unemployment rate considerably higher than that of California or the United States as a whole. The availability of jobs may be the principal restraint on the region's population growth.

INCOME

Data on personal income in the county, both historical and projected, are presented in tables B-2 and B-3.

Per capita income also increased its annual rate gain in the last half of the sixties. From 1965 to 1970, per capita income grew 8.1 percent annually, up from the 2.6 percent rate of the 1960 to 1965 period. The substantial income gains of the late sixties came as the result of inflation and rapid growth in the local economy. Despite these gains, San Diego County per capita income of $7,597 continues to lag behind the statewide figure of $8,536 primarily because of the large military and retired population in the county. According to the OBERS projections, the gap will remain through 1980. Citizens of San Diego County will be receiving an average of $8,765 compared with $9,697 for the State. Real per capita income (expressed in constant 1975 dollars) will also continue to exhibit a solid growth rate, increasing from $6,400 in 1977 to $7,500 by 1984. This is an approximate average annual growth rate of 2.3 percent over the forecast period.

POPULATION

Table B-4 presents both historical and projected population data for the region. The current population growth rate for the San Diego region (2.4 percent) is greater than the growth rates for California (1.5 percent) and the United States (0.8 percent). This growth trend is projected to continue from 1977 to 1984. The major contributor to the region's growth - both past, present, and future - is expected to be migration, which will account for 74 percent of the region's population increase. The military inservice population for the region is estimated at 119,000. This figure is expected to remain constant between 1977 and 1984.

WATER QUALITY

The results of water analysis from samples taken in August 1972 and July 1973 from two wells located on San Diego Country Club property located 1/2 mile south of Telegraph Canyon are shown below:

	Well Water 1972	1973	CWQCB Criteria*
Sodium (%)	55	49	60
Chloride (ppm)	660	638	500
Sulfate (ppm)	443	474	500
Nitrate (ppm)	18	23	45
Boron (ppm)	.46	.36	.5
TDS (ppm)	2,015	2,040	1,500

*California Water Quality Control Board groundwater quality objective criteria.

Analysis of water from the wells at the San Diego Country Club indicates that there is a saline condition along this portion of Telegraph Canyon, and that the groundwater is inferior for domestic use and most irrigation. Water quality studies by the U.S. Army Engineer District, Los Angeles, show that saline groundwater is also present in the lower Sweetwater River, approximately 2 miles to the north. This same condition has been noted along the Otay River, about 3 miles to the south.

POPULATION CHARACTERISTICS

Population characteristics of the City of Chula Vista are shown in tables B-5, B-6 and B-7.

Table B-1
Historical and projected civilian and military employment

	1940	1950	1960	1970	1978	1980	1990
California	2,525,300	3,902,300	5,761,400	7,484,700	*8,270,300	*9,063,600	*10,178,200
San Diego County	107,300	168,800	311,900	430,500	**730,580	***638,800	***864,100
City of San Diego	NA	106,300	179,600	228,100	**431,363	***387,400	***489,300
National City	NA	NA	9,000	10,300	**25,769	***16,800	***22,700
Chula Vista	NA	NA	13,100	22,000	**27,743	***25,500	***28,200

Historical data from County and City Data book.

* Employment/population ratios taken from OBERS Series C Projections - 1975.
** People actually employed in the area. Source: San Diego CPO estimate.
*** Employment/population ratios taken from Regional Comprehensive Plan Forecasts of the Comprehensive Plan Forecasts of the Comprehensive Planning Organization of the San Diego Region. (CPO)

Table B-2
Total personal and per capita income

Total personal income
(Figures x $1000)

	Current dollars				1975 dollars		
	1949	1950	1960	1970	1975	1980	1990
California	5,839.0	19,627.0	43,183.0	88,825.0	181,014.0	219,724.3	326,068.4
San Diego County	NA	931.2	2,593.5	5,632.0	11,852.3	15,788.4	25,085.7
City of San Diego	NA	NA	1,512.2	3,163.3	6,404.6	8,527.5	13,920.5
Chula Vista	NA	NA	106.6	290.3	588.2	724.5	1,060.9
National City	NA	NA	63.1	148.7	278.3	321.7	447.7

Note: Figures for 1940-1960 for California and San Diego County were taken from the 1964 California Statistical Abstract.
City Figures for 1960 and 1970 estimated from 1959 and 1969 census figures.
State and County figures for 1970 taken from U.S. Department of Commerce revised figures.
Projections made by multiplying projected per capita income by projected population.

Table B-3

Per capita income
(In 1975 dollars)

	Current dollars				1975 dollars			Median household (income)
	1940	1950	1960	1970	1975	1980	1990	1975
California	845	1,854	2,747	4,452	8,536	9,697	12,494	--
San Diego County	NA	1,672	2,511	4,148	7,597	8,765	11,189	10,982
City of San Diego	NA	NA	2,638	4,538	8,312	9,589	12,241	10,625
Chula Vista	NA	NA	2,536	4,275	7,830	9,033	11,531	11,811
National City	NA	NA	1,925	3,443	6,306	7,275	9,288	7,922

Figures for 1940-1960 computed by dividing total personal income by the population.
Figures for 1970 for State and County from U.S. Department of Commerce revised figures.
City figures for 1970 estimated from 1969 census figures. Projections are based on OBERS Series E projections.
Median household income - source 1975 special census.

Table B-4
Historical and projected populations

	1940	1950	1960	1970	1978	1985	1995
California	6,907,387	10,586,223	15,717,204	19,953,134	*22,159,000	*24,546,200	*27,889,200
San Diego County	289,348	556,808	1,033,011	1,357,854	*1,720,100	*2,041,300	*2,461,300
City of San Diego	203,341	334,387	573,224	697,027	797,380	*931,700	**1,048,800
National City	10,344	21,199	32,771	43,184	45,270	**47,700	**48,400
Chula Vista	5,138	15,927	42,034	67,901	79,700	**97,100	**131,100

Historical data from Characteristics of the Population: Number of Inhabitants.

* California State Department of Finance, Series E-150 Projections.
** Comprehensive Planning Organization of the San Diego Region projections.

Note: Population for the Rice Canyon area has been included in the City of Chula Vista 1985 and 1995 figures.

Table B-5
Population by Race, Ethnic Group, Sex and Age
(Second Count Data)1/

The total population of this area in April 1970 was 131,676 composed of 7,919 (6.0 percent) racial minorities (black and other races) and 123,757 (94.0 percent whites). The Spanish-American ethnic group, which can include whites, blacks, or other races, accounted for 29,701 (22.6 percent) of the population. The area's population includes the following number of males and females in each racial group.

	NUMBER			PERCENT DISTRIBUTION (VERTICAL)			PERCENT DISTRIBUTION (HORIZONTAL)		
RACIAL GROUP	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
Total All Races	131,676	63,293	68,383	100.0	100.0	100.0	100.0	48.1	51.9
White	123,757	59,671	64,086	94.0	94.3	93.7	100.0	48.2	51.8
Black	1,452	706	746	1.1	1.1	1.1	100.0	48.6	51.4
American-Indian	433	199	234	0.3	0.3	0.3	100.0	46.0	54.0
Japanese	1,223	404	819	0.9	0.6	1.2	100.0	33.0	67.0
Chinese	194	74	120	0.1	0.1	0.2	100.0	38.1	61.9
Filipino	2,892	1,432	1,460	2.2	2.3	2.1	100.0	49.5	50.5
Hawaiian	124	58	66	0.1	0.1	0.1	100.0	46.8	53.2
Korean	42	10	32	0.0	0.0	0.0	100.0	23.8	76.2
Other	1,559	739	820	1.2	1.2	1.2	100.0	47.4	52.6
Ethnic group (4th count data)									
Spanish-American	29,701	14,355	15,346	22.6	22.7	22.4	100.0	48.3	51.7

Age

One-half the population of this area was below 25.8 years of age. The table below shows the number andpercent of individuals in selected age groups. Age distribution is only available in the second count by total, white, black and other races.

The ages shown are as of April 1970.

AGE GROUP	TOTAL	PERCENT	WHITE	PERCENT	BLACK	PERCENT	OTHER RACES	PERCENT
Total	131,676	100.0	123,757	100.0	1,210*	100.0*	6,709*	100.0*
Under 6 years	14,689	11.2	13,569	11.0	199*	16.4*	921*	13.7*
6-9 years	11,070	8.4	10,150	8.2	181*	15.0*	739*	11.0*
10-11 years	5,642	4.3	5,215	4.2	81*	6.7*	346*	5.2*
12-13 years	5,471	4.2	5,096	4.1	79*	6.5*	296*	4.4*
14-15 years	5,518	4.2	5,160	4.2	66*	5.5*	292*	4.4*
16 years and over	89,286	67.8	84,567	68.3	604*	49.9*	4,115*	61.3*
16-21 years	14,442	11.0	13,660	11.0	133*	11.0*	649*	9.7*
22-44 years	39,206	29.8	36,468	29.5	365*	30.2*	2,373*	35.4*
40 years and over	43,723	33.2	41,902	33.9	170*	14.1*	1,651*	24.6*
45 years and over	35,638	27.1	34,439	27.8	106*	8.8*	1,093*	16.3*
50 years and over	27,084	20.6	26,305	21.3	55*	4.6*	724*	10.8*
55 years and over	19,958	15.2	19,393	15.7	32*	2.7*	533*	7.9*
60 years and over	14,321	10.9	13,898	11.2	14*	1.2*	409*	6.1*
65 years and over	9,941	7.5	9,669	7.8	7*	0.6*	265*	3.9*

1/ Data on this table is from 100 percent count.

* Data suppressed on census files.

Table B-6
Total Population
By Age, Sex, Race and Ethnic Group

AGE	TOTAL PERSONS	MALES					FEMALES				
		TOTAL	WHITE	BLACK	OTHER RACES	SPANISH AMERICAN	TOTAL	WHITE	BLACK	OTHER RACES	SPANISH AMERICAN
Total, All Ages	131,621	63,145	59,754	564*	2,827*	14,355	68,476	64,377	718*	3,381*	15,346
Under 10 years	25,904	13,167	12,217	163*	787*	3,868	12,737	11,835	188*	714*	3,692
10 to 13 years	10,813	5,399	5,107	41*	251*	1,684	5,414	5,034	103*	277*	1,585
14 to 15 years	5,358	2,650	2,468	38*	144*	832	2,708	2,541	26*	141*	856
16 to 17 years	5,362	2,613	2,467	28*	118*	665	2,749	2,605	54*	90*	760
18 to 19 years	4,523	2,034	1,892	39*	103*	600	2,489	2,310	52*	127*	629
20 to 21 years	4,554	1,922	1,856	14*	52*	439	2,632	2,521	20*	91*	537
22 to 24 years	7,641	3,686	3,571	18*	97*	625	3,955	3,771	19*	165*	845
25 to 34 years	16,082	7,782	7,435	66*	281*	1,554	8,300	7,610	91*	599*	1,933
35 to 44 years	15,565	7,272	6,753	80*	439*	1,761	8,293	7,470	84*	739*	2,033
45 to 54 years	15,547	7,495	7,191	37*	267*	1,196	8,052	7,784	32*	236*	1,191
55 to 64 years	10,316	4,975	4,795	34*	146*	685	5,341	5,254	35*	52*	685
65 years and over	9,956	4,150	4,002	6*	142*	446	5,806	5,642	14*	150*	600
Selected Groups											
16 years and over	89,546	41,929	39,962	322*	1,645*	7,971	47,617	44,967	401*	2,249*	9,213
16 to 21 years	14,439	6,569	6,215	81*	273*	1,704	7,870	7,436	126*	308	1,926
16 to 64 years	79,590	37,779	35,960	316*	1,503*	7,525	41,811	39,325	387*	2,099*	8,613
45 years and over	35,819	16,620	15,988	77*	555*	2,327	19,199	18,680	81*	438*	2,476
Vertical Percentages											
Total All Ages	100.0	100.0	100.0	100.0*	100.0*	100.0	100.0	100.0	100.0*	100.0*	100.0
Under 10 years	19.7	20.9	20.4	28.9*	27.8*	26.9	18.6	18.4	26.2*	21.1*	24.1
10 to 13 years	8.2	8.6	8.5	7.3*	8.9*	11.7	7.9	7.8	14.3*	8.2*	10.3
14 to 15 years	4.1	4.2	4.1	6.7*	5.1*	5.8	4.0	3.9	3.6*	4.2*	5.6
16 to 17 years	4.1	4.1	4.1	5.0*	4.2*	4.6	4.0	4.0	7.5*	2.7*	5.0
18 to 19 years	3.4	3.2	3.2	6.9*	3.6*	4.2	3.6	3.6	7.2*	3.8*	4.1
20 to 21 years	3.5	3.0	3.1	2.5*	1.8*	3.1	3.8	3.9	2.8*	2.7*	3.5
22 to 24 years	5.8	5.8	6.0	3.2*	3.4*	4.4	5.8	5.9	2.6*	4.9*	5.5
25 to 34 years	12.2	12.3	12.4	11.7*	9.9*	10.8	12.1	11.8	2.7*	17.7*	12.6
35 to 44 years	11.8	11.5	11.3	14.2*	15.5*	12.3	12.1	11.6	11.7*	21.9*	13.2
45 to 54 years	11.8	11.9	12.0	6.6*	9.4*	8.3	11.8	12.1	4.5*	7.0*	7.8
55 to 64 years	7.8	7.9	8.0	6.0*	5.2*	4.8	7.8	8.2	4.9	1.5*	4.5
65 years and over	7.6	6.6	6.7	1.1*	5.0*	3.1	8.5	8.8	2.0*	4.4*	3.9
Selected Groups											
16 years and over	68.0	66.4	66.9	57.1*	58.2*	55.5	69.5	69.8	55.9*	66.5*	60.0
16 to 21 years	11.0	10.4	10.4	14.4*	9.7*	11.9	11.5	11.5	17.5*	9.1*	12.6
16 to 64 years	60.5	59.8	60.2	56.0*	53.2*	52.4	61.1	61.1	53.9*	62.1*	56.1
45 years and over	27.2	26.3	26.8	13.7*	19.6*	16.2	28.0	29.0	11.3*	13.0*	16.1
Median Age	25.9	25.1	25.4	18.8*	20.6*	18.4	26.7	26.9	17.0*	26.5*	20.5

* Data suppressed on census files.

Table B-7
Living Arrangements
By Race and Ethnic Group

PERSONS IN HOUSEHOLDS	TOTAL	WHITE	BLACK	OTHER RACES	SPANISH AMERICAN
Total persons in households	130,595	123,174	1,380*	6,247*	29,611
Head of household	41,878	40,054	442*	1,588*	7,096
Family head	34,432	32,827	252*	1,353*	6,442
Male	30,451	29,108	206*	1,137*	5,597
Female	3,981	3,719	46*	216*	845
As percent of total family heads	11.6	11.3	18.3*	16.0*	13.1
Primary individual 1/	7,446	7,227	190*	235*	654
Male	2,792	2,705	53*	74*	272
Female	4,654	4,522	137	161*	382
Wife of head	29,788	28,116	211*	1,461*	5,566
Child of head	52,819	49,362	678*	2,779*	15,189
Other realtive of head	4,143	3,811	45*	287*	1,452
Nonrelative of head (includes roomer, friend, etc.)	1,967	1,831	4*	132*	308
Population per household	3.1	3.1	3.1*	3.9*	4.2
Persons in group quarters	1,026	957	44*	25*	90
Inmate of institution	635	622	13*	0*	12
Male	209	205	4*	0*	0
Female	426	417	9*	0*	12
In rooming house	188	132	31*	25*	36
In military barracks	0	0	0*	0*	0
In college dormitory	0	0	0*	0*	0
In other group quarters	203	203	0*	0*	42
Families by presence of own children and type					
Families with own children under 18 years	19,734	18,527	206*	1,001*	4,706
Percent of all families	57.3	56.4	81.7*	74.0*	73.1
Husband-wife families	16,450	15,509	165*	776*	4,073
Other family with male head	337	309	0*	28*	45
Family with female head	2,947	2,709	41*	197*	588
Families with own children under 6 years	9,613	8,909	105*	599*	2,457
Percent of all families	27.9	27.1	41.7*	44.3*	38.1
Husband-wife families	8,283	7,722	78*	483*	2,133
Other family with male head	104	92	0*	12*	21
Family with female head	1,226	1,095	27*	104*	303
Persons under 18 years by residence with parents					
Total persons under 18 years	47,437	44,274	641*	2,522*	13,942
Percent living with both parents	80.8	80.9	77.5*	79.6*	82.7
Percent living with one parent	16.1	16.0	19.2*	17.4*	13.7
Percent living with neither parent	3.1	3.1	3.3*	3.0*	3.6

1/ A household head living alone or with nonrelatives only.
* Data suppressed on census files.

APPENDIX C

FORMULATION, ASSESSMENT, AND EVALUATION OF DETAILED PLANS

COMPARISON OF ALTERNATIVE PLANS
(SUMMARY SYSTEM OF ACCOUNTS)

	Flood plain management Plan A-1 Reach I & II	Flood proofing Plan A-2 Reach I & II	Rectangular concrete channel Plan B Reach I	Rectangular concrete channel Plan B Reach II	Rectangular concrete and earth-bottom channel Plan C-1 Reach I (NED plan)	Rectangular concrete and earth-bottom channel Plan C-1 Reach II	Rectangular concrete channel Plan C-2 Reach I	Rectangular concrete channel Plan C-2 Reach II	Earth-bottom channel Plan C-3 Reach I	Earth-bottom channel Plan C-3 Reach II	Retention dam with concrete channel Plan D Reach I & II	Concrete and earth-bottom concrete with a diversion Plan E Reach I	Concrete and earth-bottom concrete with a diversion Plan E Reach II	Rectangular concrete and earth-bottom channel Plan M Reach I	Rectangular concrete and earth-bottom channel Plan M Reach II
Level of protection		100-Year	S. P. F.*		60-Year	60-Year	60-Year		60-Year		100-Year	100-Year	100-Year	100-Year	25-Year
Economic justification		Unjustified	Unjustified		Justified	Unjustified	Justified	Unjustified	Unjustified	Unjustified	Unjustified	Unjustified	Unjustified	Justified	Justified
Project cost:															
Federal	0	$2,930,000	$4,060,000**	$2,380,000	$2,600,000	$2,060,000	$3,340,000	$2,060,000	$1,570,000	$1,520,000	$3,820,000	$5,600,000**	$2,280,000	$3,660,000	0
Non-Federal:															
Rights-of-way and relocation	0	740,000	6,670,000	1,490,000	1,060,000	820,000	1,200,000	820,000	3,790,000	3,530,000	10,150,000	1,510,000	810,000	1,230,000	$350,000
TOTAL COST	0	$3,670,000	$10,730,000	$3,870,000	$3,660,000	$2,880,000	$4,540,000	$2,880,000	$5,360,000	$5,050,000	$13,970,000	$7,110,000	$3,090,000	$4,890,000	$350,000
ANNUAL CHARGES (7-7/8%)															
Flood control	0	$289,000	$845,000	$305,000	$288,000	$227,000	$358,000	$227,000	$422,000	$398,000	$1,100,000	$560,000	$244,000	$385,000	$28,000
Operation and maintenance	0	30,000	15,000	7,000	9,000	6,000	9,000	6,000	11,000	7,000	60,000	9,000	6,000	9,000	7,000
TOTAL	0	$319,000	$860,000	$312,000	$297,000	$233,000	$367,000	$233,000	$433,000	$405,000	$1,160,000	$569,000	$250,000	$394,000	$35,000
Benefits:															
Flood damage benefits***	0	$219,000	$473,000	$84,000	$375,000	$72,000	$375,000	$72,000	$373,000	$88,000	$498,000	$416,000	$76,000	$430,000	$50,000
Benefit/cost ratio	0	0.7	0.6	0.3	1.3	0.3	1.02	0.3	0.9	0.2	0.4	0.7	0.3	1.1	1.4
NET BENEFITS	0	-$100,000	-$387,000	-$228,000	$ 78,000	-$161,000	$ 8,000	-$161,000	$-58,000	$-317,000	$-662,000	$-153,000	$-174,000	$36,000	$15,000
Environmental impacts															
Disturbs channel vegetation	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Decreases groundwater recharge	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No
Negative esthetic appeal	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Social well-being impacts															
No. businesses relocated	0	0	2	0	2	0	2	0	5	0	2	2	0	2	0
No. homes relocated	0	0	1	8	1	4	1	4	30	30	****	1	4	0	0
Creates new recreation	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Mental and physical security	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Standard Project Flood.
** Exceeds the Federal limitation of $3 million. Local sponsors would have to accept financial responsibility above the Federal limitation.
*** Includes reduction in flood damages, advance replacement of bridges, and location benefits.

APPENDIX D

PUBLIC INVOLVEMENT PROGRAM

STUDY PARTICIPANTS AND COORDINATION

An initial public meeting was held on May 15, 1968 at the initiation of the overall study of all streams in San Diego County flowing into the Pacific Ocean to provide an opportunity for local interests to present the character and extent of the improvements desired and the need for and the advisability of implementing a plan to meet their needs. At this public meeting, local interests indicated a desire that flood control studies be made of numerous streams in San Diego County. Telegraph Canyon Creek was foremost on a list of stream priorities established by the San Diego County Flood Control District.

Subsequently, on September 20, 1972, the Telegraph Canyon Creek Citizens Advisory Committee was formed to assist the Corps of Engineers in the development of alternative solutions to the flood problem along Telegraph Canyon Creek. This committee was comprised of local residents, businessmen, environmentalists, and representatives of both the San Diego County Department of Sanitation and Flood Control and the City of Chula Vista Engineering Department.

Members of the Telegraph Canyon Creek Citizens Advisory Committee and the Corps participated in the formulation of solutions to the flood problem during informal meetings held on November 1, 1972 (presented information concerning the flooding potential and hydrology); December 13, 1972 (agreement reached that channel improvements would be required, consisting generally of a concrete-lined channel); and March 7, 1973 (discussion regarding revision of brochure).

During 1974, project formulation required reevaluation of data to conform to new economics criteria and to comply with the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources, 38 Fed. Reg. 24778 (10 Sep 73).

A draft information brochure was presented to the Telegraph Canyon Creek Citizens Advisory Committee on April 7, 1975, at which time the suggestions of the committee were discussed.

The information brochure was given to the public prior to the public meeting held on May 28, 1975, for the presentation of alternatives.

After considering nine alternative plans that involved both structural and nonstructural solutions, the Telegraph Canyon Creek Citizens Advisory Committee recommended Plan M, a combined structural and nonstructural solution.

The Chula Vista City Council passed a resolution on October 21, 1975 recommending the selected Plan M for further detailed study. The County of San Diego Department of Sanitation and Flood Control endorsed the concept of Plan M on December 4, 1975. The San Diego County Board of Supervisors passed a resolution to that effect on April 20, 1976.

Preparation of a draft interim feasibility report was in progress when communications were received from San Diego County (January 19, 1977) and the City of Chula Vista (May 11,1977) requesting implementation of the recommended Plan M under Section 205, Flood Control Act of 1948, as amended. The potential for flood damage because of present and continuing upstream development has increased to the point where the County and City requested that the project should proceed under the most expeditious means available.

A meeting was held on August 2, 1978 with the City of Chula Vista and the County of San Diego to consider the implementation of the study under the Small Project Authority. An informal meeting was held in September 1978 with representatives of the City of Chula Vista Public Works Department and of the County of San Diego Department of Sanitation and Flood Control to discuss the draft of brochure and alternative solutions.

On April 20, 1976, the Board of Supervisors of San Diego County resolved to support the project and agreed to provide all items of local cooperation. See exhibit 1.

The Board of Supervisors reaffirmed their support of a project and their intent to provide all items of local cooperation following revision of the plan as reflected in the current (July, 1983) report. See exhibit 3.

Prior to start of construction, San Diego County will be required to enter into an agreement with the Federal Government that they will comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611. See exhibit 2 for draft of agreement.

No. 47 (TUESDAY, APRIL 20, 19

Resolution of Intent to)
Provide Assurance of)
Local Cooperation for)
Proposed Future Federal)
Flood Control Project)
on Telegraph Canyon)
Creek)

On motion of Supervisor Brown, seconded by Supervisor Conde, the following resolution is adopted:

WHEREAS, Section 4 of the Flood Control Act of August 18, 1941 authorizes and directs the Secretary of the Army to make surveys for flood control of "all streams in San Diego County, California, flowing into the Pacific Ocean," and

WHEREAS, an information brochure describing alternative proposals for flood control and allied purposes for Telegraph Canyon Creek dated May 1975, was published by the Los Angeles District of the U.S. Army Corps of Engineers, and

WHEREAS, a flood control-recreation project for Telegraph Canyon Creek extending from 4th Avenue to San Diego Bay partially within City of Chula Vista generally in accordance with "alternative Plan M" described in said information brochure dated May 1975, is being proposed in an interim feasibility report under preparation by the Los Angeles District Engineer of the U.S. Army Corps of Engineers, and

WHEREAS, it is a policy of the Federal Government, as exemplified by Section 3 of the Flood Control Act of 1936, Public Law 74-738, that no Federal monies may be appropriated for the construction of projects until local agencies have given assurances that they will assume certain obligations; and

Gong
6 Jan. 76

EXHIBIT 1

WHEREAS, it is also a requirement of the Federal Government that local agencies comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611; and

WHEREAS, the District Engineer has requested an expression of the willingness of the local agency to supply assurance satisfactory to the Secretary of the Army; and

WHEREAS, the City Council of the City of Chula Vista, by resolution 8015, supports a project generally in conformance with alternative plan M and requests the County Board of Supervisors to provide the qualified assurances of local cooperation required by the U. S. Army Corps of Engineers at this time.

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of San Diego that it supports the concept of alternative Plan M for a flood control-recreation project for Telegraph Canyon Creek.

BE IT FURTHER RESOLVED that it is the intent of this Board to provide the following assurances to the Federal Government when a project for the Telegraph Canyon Creek is authorized by Congress.

1. Provide, without cost to the Federal Government, all lands, easements, and right-of-way necessary for the construction of the project including both flood control and recreation features.

2. Bear the expense of all necessary construction, modification, or relocation of highways, bridges, utilities, and other facilities as required in connection with the project.

6 April 76

3. Contribute a sufficient protion of the cost of recreation facilities so that the total of such contribution and the cost of recreation lands and relocations will represent 50 precent of the total first cost of recreation land and facilities.

4. Maintain and operate all flood control and recreation facilities after completion of installation in accordance with regulations to be prescribed by the Secretary of the Army.

5. Hold and save harmless the United States from damages due to the construction works.

6. Adjust all water rights claims resulting from the project.

7. Prevent any obstruction, encroachment, or operation which could interfere with the proper functioning of the project, or which could cause changes in stream regimen that could damage the structural integrity of the project.

8. Provide guidance and leadership in preventing unwise future development of the flood plain by use of appropriate flood plain management techniques to reduce flood losses.

9. Assure access to all persons on equal terms for approved recreational use.

10. Provide adequate policing of the area.

11. Comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646.

12. Comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611.

Jam J
6 Apr 76

13. Recognize that the proposed project may not provide full flood protection for a 100 year frequency storm.

PROVIDED, HOWEVER, that the above referenced assurances are given to the extent the County has power to give same, and subject to their respective budget appropriations and the requirements of all applicable laws.

PASSED, APPROVED AND ADOPTED by the Board of Supervisors of San Diego County, California, this 20th day of April 1976, by the following vote:

AYES: Supervisors Walsh, Brown, Conde, Bates and Taylor

NOES: Supervisors None

ABSENT: Supervisors None

- - -

STATE OF CALIFORNIA)
County of San Diego) ss.

I, PORTER D. CREMANS, Clerk of the Board of Supervisors of the County of San Diego, State of California, hereby certify that I have compared the foregoing copy with the original resolution passed and adopted by said Board, at a regular meeting thereof, at the time and by the vote therein stated, which original resolution is now on file in my office; that the same contains a full, true and correct transcript therefrom and of the whole thereof.

Witness my hand and the seal of said Board of Supervisors, this 20th day of April, 1976.

PORTER D. CREMANS
Clerk of the Board of Supervisors

By Beatrice Mitchell
Deputy

(SEAL)

DRAFT AGREEMENT

THIS AGREEMENT entered into this _____ day of _____, 19__, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this Agreement, and the COUNTY OF SAN DIEGO BOARD OF SUPERVISORS (hereinafter called the "County");

WITNESSETH THAT:

WHEREAS, construction of the Telegraph Canyon Creek Flood Control Project (hereinafter called the "Project") was authorized by the Chief of Engineers, U.S. Army on the _____ day of _____, 19__; and in accordance with Section 205 of the 1948 Flood Control Act (PL 80-858) and its amendments; and

WHEREAS, the County hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by applicable law;

NOW, THEREFORE, the parties agree as follows:

1. The County agrees that, if the Government shall commence construction of Telegraph Canyon Creek Flood Control Project under the authority of Section 205 of the 1948 Flood Control Act and its amendments and substantially in accordance with the Detailed Project Report authorizing such work, the County shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-Federal cooperation specified in applicable law, to wit:

a. Provide without cost to the United States all lands, easements, and rights-of-way, including suitable borrow and spoil disposal areas, necessary for construction of the project.

b. Where Federal costs for the entire project exceed the limitation expressed in Section 205 of the 1948 Flood Control Act (PL 80-858) and its amendments, provide a cash contribution for the amount of excess.

c. As made necessary by construction, accomplish, without cost to the United States, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements. This provision excludes railroad bridges and approaches, and facilities necessary for the normal interception and disposal of local interior drainage at the line of protection.

d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army.

e. Prescribe and enforce regulations to prevent obstruction or encroachment on flood control works which would reduce their flood-carrying capacity or hinder maintenance and operation, and control development in the project area to prevent an undue increase in the flood damage potential.

f. Comply with requirements of the Uniform Relocation Assistance and Real Estate Acquisition Policies Act of 1970, Public Law 91-646.

g. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain.

h. Hold and save the United States free from water rights claims caused by the construction and operation of the project.

i. Hold and save the United States free from damages due to construction, operation, and maintenance of the project, excluding

damages due to the fault or negligence of the United States or its contractors.

j. The County hereby gives the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which the County owns or controls, for access to the Project for the purpose of inspection, and for the purpose of repairing and maintaining the Project, if such inspection shows that the County for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the County official. No repair or maintenance by the Government in such event shall operate to relieve the County of responsibility to meet its obligations as set forth in Paragraph 1 of this Agreement, or to preclude the Government from pursuing any other remedy by law or equity.

k. This agreement is subject to the approval of the Chief of Engineers, U.S. Army.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

APPROVED AS REQUIRED UNDER SECTION 221 OF PUBLIC LAW 91-611, AS TO FORM AND AS TO LEGAL SUFFICIENCY:

_____
County Counsel
County of San Diego

DATE:_____

COUNTY OF SAN DIEGO

By_____
Chairman, Board of Supervisors

DATE:_____

ATTEST:

By_____
Clerk of the Board of Supervisors

DATE:_____

THE UNITED STATES

By_____
Colonel, Corps of Engineers
District Engineer
Contracting Officer

DATE:_____

APPROVED:

_____

FOR THE CHIEF OF ENGINEERS

No. 17 TUESDAY, JULY 12, 1983

RESOLUTION REAFFIRMING INTENTION TO PROVIDE ASSURANCE OF LOCAL COOPERATION FOR PROPOSED FUTURE FEDERAL FLOOD CONTROL PROJECT ON TELEGRAPH CANYON CREEK

ON MOTION of Supervisor Hamilton, seconded by Supervisor Williams the following resolution is adopted:

WHEREAS on April 20, 1976 (47) the Board of Supervisors of the County of San Diego by resolution expressed the intent of San Diego County to provide assurances of local cooperation for a proposed future Federal flood control project on Telegraph Canyon Creek; and

WHEREAS the planned project is in the City of Chula Vista and County of San Diego; and

WHEREAS the City Council of Chula Vista, by resolution 8015, in March 1978 supported the project and requested the Board of Supervisors to provide qualified assurances of local cooperation; and

WHEREAS it is a policy of the Federal government, as exemplified by Section 3 of the Flood Control Act of 1936, Public Law 74-738, that no Federal monies may be appropriated for the construction of projects until local agencies have given assurances that they will assume certain obligations; and

WHEREAS it is also a requirement of the Federal government that local agencies comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611; and

WHEREAS, the District Engineer has requested your Board to reaffirm the willingness of the local agency to supply assurance satisfactory to the Secretary of the Army as set forth in resolution 47 adopted by your Board on April 20, 1976;

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of San Diego reaffirms that it supports the concept of alternative Plan M for a flood control project for Telegraph Canyon Creek.

BE IT FURTHER RESOLVED that it is the intent of this Board to provide the following assurances to the Federal government when a project for the Telegraph Canyon Creek is authorized by Congress:

Exhibit 3

1. Provide, without cost to the Federal government, all lands, easements, and right-of-way necessary for the construction of the project including both flood control and recreation features.

2. Bear the expense of all necessary construction, modification, or relocation of highways, bridges, utilities, and other facilities as required in connection with the project.

3. Maintain and operate all flood control and recreation facilities after completion of installation in accordance with regulations to be prescribed by the Secretary of the Army.

4. Hold and save harmless the United States from damages due to the construction works.

5. Adjust all water rights claims resulting from the project.

6. Prevent and obstruction, encroachment, or operation which could interfere with the proper functioning of the project, or which could cause changes in stream regimen that could damage the structural integrity of the project.

7. Provide guidance and leadership in preventing unwise future development of the flood plain by use of appropriate flood plain management techniques to reduce flood losses.

8. Assure access to all persons on equal terms for approved recreational use.

9. Provide adequate policing of the area.

10. Comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646.

11. Comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611.

PROVIDED, HOWEVER, that the above-referenced assurances are given to the extent the County has power to give same, and subject to their respective budget appropriations and the requirements of all applicable laws.

PASSED, APPROVED AND ADOPTED by the Board of Supervisors of San Diego County, California, this 12th day of July, 1983, by the following vote:

AYES: Supervisors Hamilton, Fordem, Boardman, Williams and Eckert

NOES: Supervisors None

ABSENT: Supervisors None

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STATE OF CALIFORNIA)
County of San Diego) ss.

I, PORTER D. CREMANS, Clerk of the Board of Supervisors of the County of San Diego, State of California, hereby certify that I have compared the foregoing copy with the original resolution passed and adopted by said Board, at a regular meeting thereof, at the time and by the vote therein stated, which original resolution is now on file in my office; that the same contains a full, true and correct transcript therefrom and of the whole thereof.

Witness my hand and the seal of said Board of Supervisors, this 12th day of July, 1983.

PORTER D. CREMANS
Clerk of the Board of Supervisors
By Beatrice Mitchell
Deputy

(SEAL)

APPENDIX F

HYDROLOGY

APPENDIX E
HYDROLOGY
TELEGRAPH CANYON CREEK, CITY OF CHULA VISTA

DETAILED PROJECT REPORT FOR FLOOD CONTROL
SAN DIEGO COUNTY, CALIFORNIA

CONTENTS

TABLES

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APPENDIX E
HYDROLOGY
TELEGRAPH CANYON CREEK, CITY OF CHULA VISTA

DETAILED PROJECT REPORT FOR FLOOD CONTROL
SAN DIEGO COUNTY, CALIFORNIA

I. INTRODUCTION

1-01. PURPOSE AND SCOPE. This report presents hydrology in support of **detailed project** studies of Telegraph Canyon Creek, San Diego County, California. The general location of the study area is shown on plate 1. Plate 2 shows drainage area boundaries. Basin characteristics are given in table 4. The report has four major objectives: (a) to present the basic meteorologic and hydrologic characteristics of the study area; (b) to outline the methods and techniques used to model the runoff process; (3) to present discharge frequency valves for present and future basin development under preproject conditions; and (4) to provide discharge frequency values for present and future basin development considering the proposed flood control project. Throughout this report, the phrase "present conditions" refers to basin development in project year 1 (1984); likewise, "future conditions" refers to project year 6 (1990) and beyond. Peak discharge values for present and future conditions are given in tables 1 and 2. Standard project flood (SPF) and 100-year flood peak discharges are also shown on plates 4 thru 7. Although the basin is to reach its maximum development by 1990, some portions above Interstate 805 will not have been urbanized. To aid in assessing the impact of developing this area on downstream peak discharges, "ultimate condition" peak discharges are given in table 3.

1-02. PREVIOUS REPORTS. The only previous Corps of Engineers report containing hydrologic information specific to Telegraph Canyon is

"Hydrology for Survey Report, Telegraph Canyon, Spring Valley, and Las Chollas Valley, San Diego County, California", dated August 1974. This and other references with material of hydrologic importance for the study area are listed in the bibliography.

1-03. PROPOSED PLAN OF IMPROVEMENT. The proposed plan of improvement consists of approximately 1 mile of rectangular concrete channel between Fourth Avenue and Interstate 5 (I-5), and about 0.4 mile of trapezoidal earth-bottom channel from I-5 to San Diego Bay. In addition to an inlet structure upstream of Fourth Avenue, new bridge crossings at National Avenue, Fifth Avenue, and Fourth Avenue would be required.

II. GENERAL DESCRIPTION OF THE DRAINAGE AREA.

2-01. PHYSIOGRAPHY AND TOPOGRAPHY. Telegraph Canyon Creek originates in the hills east of the City of Chula Vista and flows in a westerly direction, through the City of Chula Vista, into the southern portion of San Diego Bay. The basin is long and narrow, the average width being less than 1 mile and the average length about 10 miles. The total drainage area is about 7.5 square miles at I-5. Elevations in the basin range from about 790 feet above sea level at the eastern end of the basin to sea level at San Diego Bay. Slopes along the main stream vary from about 160 feet per mile in the upper reaches to approximately 50 feet per mile through the City of Chula Vista. The average slope along the longest watercourse is about 77 feet per mile. Land use in the upper portion of the basin, above I-805, is mainly agricultural at present. Below I-805, the basin is nearly fully urbanized. Pertinent data for the watershed are given in tables 4 and 5.

2-02. GEOLOGY AND SOILS

a. The geology of the Telegraph Canyon area is a series of wave-cut marine terraces of sedimentary material extending from San Diego Bay to the foothills 5 to 10 miles inland. The terraces in the study area are collectively known as the Otay Mesa. They are composed of horizontal or very gently dipping siltstone, sandstone, and conglomerate beds of Tertiary Age, thought to have been derived from highlands to the east and deposited by ancient streams in shallow water at the shoreline. In a few places within the study area, a pebbly sandstone and conglomerate layer of younger age can be found as a blanket extending over the edges of the higher terraces onto the lower terraces. Deposits of Recent Age occur as capping on the lower terraces, as valley bottom alluvium, and as delta flats.

b. There is evidence of minor tectonic activity in the mesa region, as indicated by the gently dipping attitude of the sedimentary beds. In the geologic past, uplift has raised the terraces to their present levels and has caused local stream channels to become entrenched.

c. Exposed soils in the upper parts of the basin are fine sandy loams, which become finer as one travels to a lower elevation. In the lower areas where not altered by urbanization, soils are fine sandy, silty loams. Most of basin has been classified by the Soil Conservation Service as being in hydrologic soil group D.

2-03. VEGETATION. Little natural vegetation exists in the study area. Most of the upper portion is devoted to feed grains, although small plots used for truck crops are rotated around the basin in the summer

months. During the winter months, the fields support sparce, shallow rooted weeds and volunteer grains which have little effect in retarding runoff.

2-04. LAND USE.

a. Land use projections were based on the Chula Vista Planning Commission's General Plan to 1990. Plate 8 shows the extent of projected development.

b. The City of Chula Vista expects ultimate development to conform essentially to their 1990 plan. The limiting factor is said to be existing sewer capacity. There appears to be no topographical reason, however, why most of the reserved area could not be developed since the City only limits development on slopes greater than 25 percent. Hence, the effects of complete development of the basin are discussed in paragraph 5-06.

2-05. RUNOFF CHARACTERISTICS. Because climatic and drainage area characteristics are not conducive to continuous flow, little streamflow occurs except during and immediately following rains. Runoff increases rapidly in response to rainfall excess. Baseflow and percolation are considered negligible. Snowmelt is not a contributing factor to runoff in this basin.

2-06. CLIMATOLOGY.

a. San Diego and vicinity has a mild subtropical climate with warm winters and relatively cool summers. Along the coast the weather is greatly tempered by the influence of the Pacific Ocean, especially during the summer months. At Chula Vista, the average temperature range varies

seasonally from 20 degrees F during the winter ($42^{o}/62^{o}$ in January) to only 10 degrees in summer ($63^{o}/73^{o}$ in August). Freezing temperatures seldom occur along the coast. In the upper portion of Telegraph Canyon, winter nights average a few degrees cooler, with frost somewhat more common, and summer days are significantly warmer.

b. Mean annual precipitation in the study area ranges from about 9 inches at the coastline to about 11 inches at the head of Telegraph Canyon (see plate 3). Most rainfall occurs between November and April but wide variations take place in monthly and seasonal totals. Rainless periods of several months are very common during the summer. A summary of monthly and annual precipitation for the National Weather Service Station at Chula Vista, near the mouth of Telegraph Canyon, and for Otay Ranch, just outside the upper portion of Telegraph Canyon, are given in table 5. Both sets of data are based upon the 30 year means for the period 1941-1970, the period used by the Weather Service to compute it's current climatic normals.

c. There are three basic types of storms which can affect the study region, although some individual storms may consist of a combination of types.

(1) General winter storms usually occur during the period from November through April, with the greatest frequency and intensity normally occurring from December through March. These storms usually originate over the north Pacific Ocean as the result of the interaction between polar and tropical air masses and move eastward across the North American west coast. This type of storm, which often lasts for several days, reflects orographic influence and is usually accompanied by

widespread precipitation in the form of rain, often with snow in the higher elevations. Some of the significant general winter storms which have affected San Diego County include those late January 1862, 1-7 and 7-14 February 1884, 3-9 March 1884, 11-16 and 21-26 December 1889, 21-25 February 1891, January 1895, 23-25 March 1906, 14-19 and 24-29 January 1916, 18-27 December 1921, 10-17 February 1927, 5-7 and 13-15 February 1937, 27 February-4 March 1938, 23-25 December 1940, 12-15 March 1941, 10-13 April 1941, 14-18 and 22-25 November 1965, 9-16 December 1965, 3-7 December 1966, 8 March 1968, 13-15 and 23-26 January 1969, 5-7 and 24-26 February 1969.

(2) Local storms can occur at any time of the year, either during general storms or as isolated phenonema. Local summer storms are infrequent along the coast but are not uncommon in the interior mountains. These storms, which normally result from a flow of moist tropical air into the region from the south and east, cover comparatively small areas but result in high-intensity precipitation of durations of three hours or less. Local winter storms can occur in conjunction with a strong cold front or a deep upper level low pressure center and are often imbedded within a general winter storm. Like their summer counterparts, these local winter storms result in high-intensity precipitation for short durations over small areas. A few of the more significant local storms which have affected the coastal southern California areas include the thunderstorms of 12 October 1889 (Encinitas), 12 August 1891 (Campo), 18 July 1922 (Campo), 18 July 1922 (Squirrel Inn), 5 April 1926 (Opid's Camp), 14 March 1941 (Sunny Hills Ranch, near Fullerton), 21 October 1941 (Avalon), 3-4 March 1943 (Sierra Madre), 29 September 1946 (Alta Loma-

Cucamonga), 18 July 1955 (Vallecito), 10 December 1965 (San Diego Airport), 8 March 1968 (Bonita-Chula Vista), 14 January 1969 (Kearny Meas, San Diego), and 4 December 1974 (El Cajon).

(3) General summer storms have occasionally occurred in southern California during the summer and early fall months, usually in the form of tropical cyclones which originate off the west coast of Mexico and move northward toward California. A tropical storm of near hurricane intensity move onshore around Long Beach, California on 25 September 1939, and a number of other tropical storms have also had significant effects upon Southern California--with the greatest effects most frequently upon San Diego County, Some of these include the tropical cyclones of August 1889, 30 September - 1 October 1921, 17-19 September 1929, 28-30 August 1951, 17-18 September 1963: "Katherine," 1-2 September 1967: "Katrina," 6-7 September 1972: "Hyacinth," and 6-7 October 1972: "Joanne".

2-07. EXISTING AND PLANNED LOCAL IMPROVEMENTS. Existing and planned local improvements in the study area are confined to stream channel improvements in some reaches and one culvert enlargement. (see plate 9). These facilities would provide protection for about a 100-year flood. The improvements are described as follows: existing concrete lined channel from 4th Avenue downstream about 500 feet (3,200 cfs with no freeboard); proposed concrete lined channel from Hilltop Drive to 1st Avenue to be constructed in the near future (3,000 cfs design capacity); culvert thru Hilltop Drive to be enlarged in late 1975 (3,000 cfs design capacity); and proposed concrete lined channel from about 500 feet downstream of I-805 to about 1,500 feet upstream of Hilltop Drive to be constructed in the near future (3,000 cfs design capacity).

III. STORMS AND FLOODS OF RECORD

3-01. GENERAL. Little historical information is available regarding floods on the major rivers of San Diego County, and almost no information is available regarding floods on any of the smaller streams prior to the mid - 20th Century. Recorded runoff data for Telegraph Canyon Creek was non-existent until mid - 1973 when a stream gage was installed at the 4th Avenue crossing. Brief descriptions of the more notable storms and floods which have occurred in the general vicinity, together with the 3-4 March 1943 storm which was used to develop standard project flood discharges, are given in the following paragraphs. Pertinent information on other important storms and floods which have occurred in the area are included in table 6.

3-02. STORMS AND FLOODS OF 14-19 AND 24-29 JANUARY 1916. The entire month of January 1916 was characterized by an unusually persistent series of intense Pacific storms. The heaviest storm period occurred from 14 to 19 and 24 to 29 January, the second of which produced the largest flood of the 20th Century on the San Diego River. Precipitation in the 14-19 January storm ranged from less than 4 inches along the coast south of San Diego to over 21 inches in the higher mountains of the County. In the 24-29 January storm, rainfall varies from 2.8 inches at the San Diego rain gage to more than 19 inches in the higher mountains, with about two-thirds of the total storm precipitation occurring during a 12 hour period on 27 January. The very high intensities of the 24-29 January storm, coupled with the saturation of the soil by the 14-19 January storm, resulted in highly destructive floods on the San Diego River in Mission Valley, as well as elsewhere. The peak flow on the

San Diego River, which occurred on 27 January, was estimated by the USGS to be around 75,000 cfs at the mouth of the river and about 70,000 cfs near Santee. At least two dams, Sweetwater Dam and Lower Otay Dam, were severly damaged or destroyed by flood waters.

3-03. STORM AND FLOOD OF 10-17 FEBRUARY 1927. The storm of 10-17 February 1927 was general over all of California. It began on 10 and 11 February and became more intense from 14 to 17 February as a series of storms moved eastward across California at low latitudes. The maximum 24-hour rainfall (ending 2000 16 February) varied from 1.7 inches at the San Diego recording gage to 13.0 inches at Cuyamaca in the interior mountains. The peak discharge on the San Diego River at the Santee gage was estimated by the U. S. Geological Survey as 45,400 c.f.s.

3-04. STORM AND FLOOD OF 3-4 MARCH 1943.

a. General rainfall of moderate to heavy intensity occurred over all of Southern California from 3 to 6 March 1943, as a deep subtropical Pacific storm moved slowly onto the coast at low latitudes. However, it was a very intense local storm that occurred in the foothills of Los Angeles County between 2200 hours on 3 March and 0100 hours on 4 March which is the most significant feature of the storm period. This thunderstorm resulted in short duration precipitation of near record breaking magnitude for the Southern California coastal region. The cloudburst apparently began, in the midst of a light to moderate general rain, over the southern part of Los Angeles and moved northeastward at approximately 7 miles per hour to the San Gabriel Mountains. The highest observed intensities occurred at the Sierra Madre - Carter station, where maximum 15-, 30-, 60-minute, and 3-hour intensities of 5.5, 3.6, 2.7, and

1.1 inches per hour, respectively, were recorded. Many automatic precipitation gages were in operation at the time for this storm; hence the areal distribution of this cloudburst precipitation was very well measured. The storm has been researched in great detail and serves as a basis for the March 1967 report "Generalized Standard Project Rainflood Criteria for Southern California Coastal Streams," prepared by the Hydrologic Engineering Center of the Corps of Engineers (reference 2).

b. Runoff from the March 1943 storm was moderate to heavy from local drainages where high precipitation intensities occurred, but few quantative measurements are available from these areas. It is felt that a storm very similar to this March 1943 thunderstorm could occur in the coastal areas of San Diego County, including Telegraph Canyon, especially in light of the intensities observed in the 8 March 1968 local storm of Bonita - Chula Vista (see paragraph 3-05).

3-05. STORM AND FLOOD OF 8 MARCH 1968.

a. The storm of 8 March 1968 was general over all of Southern California. It resulted from the passage of a strong cold frontal system across the region from out of the northwest. The maximum 24-hour precipitation in San Diego County ranged from 1 inch along the coast to as much as 4 inches in the mountains. However, it was the short-term (30-minute to 3-hour) local rainfall intensities associated with the immediate cold front passage which produced the greatest flooding. Various official and unofficial reports of precipitation amounts during the morning hours of 8 March include: 1.9 inches in 30 to 45 minutes (a rate of 2.5 to 3.8 in/hr) at the Chula Vista municipal golf course, 2.4 inches in 2 hours (1.2 in/hr) in south Chula Vista (reported by a

local resident), and 3.15 inches in 3 hours (1.05 in/hr) in Bonita (reported by a regular U. S. Weather Bureau observer). Away from the center of the storm the San Diego County Operations Center recorded 0.54 inches in 30 minutes (1.08 in/hr), and a Coronado resident reported 1.5 inches in 3.5 hours (0.43 in/hr). Heavy short-term local rainfall was also reported in the Encinitas - San Dieguito and the Oceanside - Vista areas.

b. Heavy runoff from several coastal creeks, especially in urbanized areas, resulted in the flooding of streets, homes, schools, and business establishments. Some of the larger estimated peak flows in San Diego County include: 600 c.f.s. (750 c.f.s./sq. mi.) on Judson Creek at 1st Avenue, and 60 c.f.s. (300 c.f.s./sq. mi.) on South Tributary, Telegraph Canyon Creek at Clariss Street. Some recorded flows in the area include: 1,400 c.f.s. (230 cfs/sq. mi.) on South Las Chollas Creek Tributary at Euclid Avenue and Market Street, 3,100 c.f.s. (220 cfs/sq. mi) on Las Chollas Creek at Wabash and Oceanview Blvd., and 660 c.f.s. (150 cfs/sq. mi.) on Spring Valley Creek at Goodland Acres Park. A complete report on the storm and flooding of 8 March 1968 in San Diego County can be found in reference 3.

c. This local storm of 8 March 1968 is of significance to south coastal San Diego County in that its 30-minute to 3-hour intensities are the greatest of record in that region. Since there was only one recording rain gage (San Diego Lindbergh Field) within the general vicinity, and no recorders within the central area of the local cloudburst, a complete and accurate depth-area-duration analysis of this local storm is impossible. However, those intensity-duration values which were

observed in this March 1968 cloudburst appear to be consistent with the values used for the standard project storm in this study.

IV. SYNTHESIS OF STANDARD PROJECT FLOOD

4-01. GENERAL. The standard project flood (SPF) represents the flood that would result from the most severe combination of meteorologic and hydrologic conditions considered reasonably characteristic of the region. It normally is larger than any past recorded flood in the area, and can be expected to be exceeded in magnitude only on rare occasions.

4-02. STANDARD PROJECT STORM. The most severe storm that could be reasonably expected to occur over the study area was determined to be a high intensity, short duration local storm equivalent to the storm of 3-4 March 1943 which was centered in the Los Angeles area. Rainfall amounts and intensity patterns were taken, unaltered, from the report "Generalized Standard Project Rainflood Criteria for Southern California Coastal Streams" (reference 2).

4-03. DETERMINATION OF RAINFALL-RUNOFF RELATIONSHIPS

a. Flood Reconstitutions. Reconstitution of 19 observed flood events in Coastal San Diego County was accomplished to determine applicable relationships between rainfall and runoff for use in computing hypothetical flood hydrographs. Table 7 outlines the stream gage locations and storms used for each reconstitution. The HEC-1 Flood Hydrograph Package computer program was used to perform a regional unit hydrograph and loss rate study in order to derive rainfall-runoff relationships applicable to the San Diego area. Table 8 presents a summary of "best-fit" unit hydrograph and rainfall loss rate parameters determined for each recon-

stitution. Interpretation of the HEC-1 reconstitutions enabled selection of appropriate rainfall-runoff relationships for Coastal San Diego County. Sample reconstitutions are presented graphically on plates 11 thru 14. Reconstitution procedures are discussed in detail in reference 1.

b. Unit Hydrographs. The unit hydrograph procedure used by the Los Angeles District has its basis in an S-graph which is the time distribution of runoff as a function of basin lag time. Lag time is defined as the time in hours for 50 percent of the total volume of runoff of the unit hydrograph to occur. The basin lag time can be approximated for ungaged watersheds by the use of lag relationship presented on plate 15. The basin n value is a proportionality factor in the equation for lag time which permits adjustment of lag time depending on type of ground cover and surface characteristics affecting basin response to effective rainfall. An example of a unit hydrograph developed using this procedure can be seen on plate 16.

(1) S-Graphs. The concentration of excess rainfall in the Coastal San Diego County area can be described by one S-graph. This S-graph is presented on plate 17. A single representative S-graph was developed from a comparison of the S-graphs derived in the reconstitutions. No distinction could be clearly made among valley, mountain, or urban S-graphs; hence, the decision to select a single representative S-graph. Since much of the basin investigated for this report is urbanized, a comparison was made with the Average Valley S-graph developed in urban areas of Los Angeles (see plate 17). It can be seen that the use of the Coastal San Diego County S-graph adequately describes the time distribution of runoff from watersheds in the study area.

(2) Basin n Values. Basin n values derived from the reconstituted unit hydrographs were used as a general guide to establish standard project flood basin n values for the study region. Adjustments, based on judgement, were made to consider the influence of any surface characteristics which affect the lag time of the watershed.

c. Rainfall Loss Rate Function.

(1) HEC loss rate parameters derived from the reconstitutions are as follows:

STRKR = 0.40 DLTKR = 2.5 RTIOL = 3.0 ERAIN = 0

for a condition of no antecedent rainfall. A graphical representation of this loss rate function is shown on plate 18. The initial portion of this loss rate function has a high loss rate indicative of a dry watershed in which the loss of interception and depression storage as well as high infiltration rate must be satisfied before rainfall excess becomes available for runoff. The more slowly decreasing portion of the loss rate function seeks to describe the slowly decreasing infiltration rate as a function of accumulated loss. The HEC loss rate function accounts for urbanization by reducing the effective loss rate in direct proportion to the percent impervious cover. Included on plate 18 is the loss rate function adjusted for 5 inches of antecedent rainfall loss. (The Jan. 14-19, 1916 storm dumped heavy rainfall amounts, up to 21 inches in the mountains prior to the high intensity rainfall of Jan. 24-29, 1916 rainfall which produced the largest flood of record, about 70,000 cfs. on the San Diego River at Santee). The HEC loss rate function parameters then become:

STRKR = 0.20 DLTKR = 0 RTIOL = 3.0 ERAIN = 0

(2) For ease of computation, this study adopted a constant loss rate of 0.20 inch per hour, with an imprevious factor to account for development. Percentages of imprevious cover for each subarea are given in table 4.

4-04. FLOOD ROUTING.

a. Flood routing in channels was accomplished by the Muskingum method of channel routing. This method was used because of its ability to consider channel storage in describing the attenuation of a flood wave. Some degree of overbank flow often occurs in streams in the study area.

b. Flood wave travel time in a reach, which approximates the Muskingum coefficient k, was determined by dividing reach length by average peak flow velocity. Manning's formula for normal flow and an appropriate cross section were used to compute the average peak flow velocity for the reach. Cross sections were determined from available topographic maps and from field inspection. Estimates of Muskingum x values were based on the amount of overbank flow encountered. X values vary from zero to 0.5. An x value of 0.3 would be appropriate for a well defined natural channel with no overbank flow. Zero would be used when most of the flow is overbank. Muskingum coefficients are given in table 9.

c. The culvert through I-5 has limited capacity, and large flood flows would pond upstream of the freeway. If volumes are sufficiently large, floodwaters would overflow the ponding area immediately in front of the culvert, and flow north to the low-lying area in the vicinity of L Street. When ponding occurred, reservoir type routing of flood flows was accomplished by the Modified Puls routing procedure. Elevation-capacity relationships were derived from available 1" = 200' scale topography, with 5' contours. The results of the reservoir routings are given in table 10.

4-05. COMPUTATION OF STANDARD PROJECT FLOOD

a. Stream System Analysis.

(1) The stream system analysis approach to computation of design floods involves division of a study area into subbasins which are

homogeneous with respect to hydrologic and meteorologic factors; the flood hydrographs generated from each subbasin are then routed and combined to determine the design flood at a desired concentration point. Subdividing a watershed permits more accurate modeling of the runoff process, as variations in topgraphy and urbanization, as well as changes in channel characteristics, may be incorporated into the hydrologic description of the basin.

(2) Standard project floods were computed by centering the standard project storm in the most critical flood producing manner. Application of the rainfall loss rate function described previously to standard project precipitation enables determination of the rainfall excess. The rainfall excess is then applied to the subbasin unit hydrograph to produce the subbasin flood hydrograph. Combining and routing of subbasin flood hydrographs to the desired concentration point completes the computation of a standard project flood.

b. Standard Project Flood Peak Discharges. Standard project flood peak discharges, computed as described in the foregoing paragraphs, are presented for four conditions: (1) present, no project conditions; (2) future, no project conditions; (3) present, with project conditions; ans (4) future, with project conditions. Table 1 and 2 and plates 4 thru 7 give SPF peak discharges for each condition.

c. Adequacy of Standard Project Flood. The standard project flood is of a magnitude that would be exceeded only on rare occasions. Because of the lack ot long term streamflow records in the study area, the adequacy of standard project flood is best determined from a comparison with the enveloping curve peak discharges for other coastal streams in

Southern California (plate 19) and with probable maximum flood. In comparing selected standard project flood peak discharges with probable maximum flood peak discharges, standard project flood was found to be about 40 percent of probable maximum flood. SPF peak estimates reflect a recurrence interval of about 500 years in this study area.

V. DISCHARGE FREQUENCY ANALYSIS

5-01. GENERAL. Discharge frequency analysis in the study area involved determination of peak discharge frequency values for present and future conditions of basin development, both with and without the proposed project. The analysis was complicated by the lack of stream flow data. The one stream gage which exists in the basin, Telegraph Canyon Creek at 4th Avenue, was installed in 1973. In addition is the problem created by the variation in urbanization of the basin. The lower portion is fully developed, while the upper portion above Interstate 05 is essentially undeveloped at present and is expected to be partially urbanized in the future.

5-02. DISCHARGE FREQUENCY DETERMINATION.

a. In the absence of stream flow data, 100-year and 50-year flood peak discharges in the basin were based mainly on rainfall frequency and checked using "typical fully urbanized frequency curves" developed in reference 1 where appropriate. The actual relationship between frequency of rainfall and the derived flood is obscure as each part of the computational model introduces some joint probability. For this reason, frequency analysis of observed stream flow data is the preferred procedure.

b. The basic premise in the rainfall-runoff procedure is that if "average" values of other parameters such as basin n value, antecedent moisture, and loss rate are used, the frequency of the derived flood should approximate the frequency of rainfall. The rainfall parameters chosen in this study to preserve the consistency between rainfall and runoff frequency were the maximum 15 minute, 30 minute, 1 hour, and 3 hour precipitation amounts. In a small basin such as Telegraph Canyon Creek, these parameters are good indicators of storm severity. The maximum t-hour rainfall amounts were determined from n-year 6 hour and n-year 24 hour precipitation amounts and regression equations for finding n-year t-hour amounts developed by the U.S. Weather Service. Depth-area relationships were based on the storm analysis presented in reference 2.

c. One hundred-year and 50-year flood peak discharges were calculated in the same manner as SPF. Peak discharges were computed using estimated loss rates of 0.2-0.3 inches per hour and 0.3-0.4 inches per hour for 100-year and 50-year floods, respectively. The range of loss rates made little difference in the magnitude of the computed peak discharges. Using low loss rates is considered appropriate in view of the runoff potential of the area indicated by the hydrologic soil group D designation.

5-03. PRESENT CONDITION, NO PROJECT FREQUENCY CURVES.

a. Concentration Points Above Hilltop Drive. Present condition frequency curves for points of interest above Hilltop Drive were estimated by using the slope of a curve derived for Telegraph Canyon Creek at Hilltop Drive. This curve was constructed by plotting 100-year and 50-year peak discharges, computed as described in paragraph 5-02, and an estimated 5-year peak discharge at Hilltop Drive. A smooth curve was then fitted

to the plotted points (see plate 20). The magnitude of the estimated 5-year peak discharge at Hilltop Drive was based on the capacity of the Culvert at Hilltop Drive, about 400 cfs, and the observation by the City of Chula Vista personnel* that the culvert is flowing full or nearly full on the average of about every 5 years.

b. Concentration Points Below Hilltop Drive. The magnitudes of the 100-year and 50-year flood peak discharges at concentration points below Hilltop Drive were also based on rainfall-runoff computations described in paragraph 5-02. Similar values were obtained by routing and combining subarea hydrographs, reduced by the ratio of n-year peak to SPF peak. The ratios for undeveloped subareas were determined from the frequency curve discussed in paragraph 5-03a, while ratios for the developed areas were taken from the slope of the "typical fully urbanized frequency curve," derived in reference 1 and updated to include three additional years of stream gage record. Since the ratio approach yielded results similar to the rainfall-runoff method for the 100-year and 50-year flood peaks, the ratio technique was used to determine the lower end of the frequency curve for points below the Hilltop Drive, thereby eliminating the need to estimate rather uncertain rainfall-runoff parameters for frequent flood events.

5-04. FUTURE CONDITION, NO PROJECT FREQUENCY CURVES.

a. Concentration Points Above Hilltop Drive. Future condition frequency curves for points above Hilltop Drive were derived in a manner similar to the frequency curves for present conditions. Rainfall method 100-year and 50-year flood peaks were again calculated from rainfall,

*Telephone conversation with Bill Harshman, Hydrologist for the City.

adjusting the appropriate parameters for the change in land use of the subbasins. The frequency curve was then completed by extrapolation. Care was taken to insure that the results obtained were reasonalbe when compared to present conditions.

b. Concentration Points Below Hilltop Drive. The same procedures used for present conditions were used to determine future condition discharge frequency values. Since the lower subareas are essentially fully developed at present, the changes in rainfall-runoff parameters or n-year peak to SPF peak ratios were due to land use changes in the upper subbasins.

5-05. FREQUENCY CURVES WITH PROPOSED PROJECT. The effect of the proposed Corps of Engineers channel improvement is to decrease flood wave travel time from Fourth Avenue to I-5. The change in travel time was accounted for by changing the flood routing coefficients in this reach. Since the improved reach is short, the change in the peak discharge at I-5 is fairly small, especially for the frequent flood events.

5-06. ULTIMATE CONDITION FREQUENCY CURVES. Although the basin is not expected to develop beyond the 1990 land use plan, it would be of interest to determine the effect on peak discharges in the basin if complete development were to take place. To this end, SPF and n-year peak discharges were estimated using the methods described in the foregoing paragraphs, with appropriate adjustments for land use changes

5-07. DISCHARGE FREQUENCY VALUES. Using the procedures described above, n-year peak discharges were determined for all pertinent concentration points. These values are presented in tables 1, 2, and 3.

VI. COMPARISON WITH OTHER STUDIES

6-01. GENERAL. The County of San Diego Department of Sanitation and Flood Control has developed 100-year flood peak discharges for selected points along Telegraph Canyon Creek. The County's discharges were computed using a modification of the SCS procedure. Because of the SCS curve number chosen, little difference in peak discharge between present and future conditions was found. The procedures described in Section V yielded a future condition 100-year flood peak discharge at I-5 which compares relatively well with the County's value.

VII. BIBLIOGRAPHY

1. Hydrology for Survey Report, Telegraph Canyon, Spring Valley, and Las Chollas Valley, San Diego County, California, U.S. Army Engineer District, Los Angeles, Corps of Engineers, August 1974.

2. Generalized Standard Project Rainflood Criteria for Southern California Coastal Streams, Hydrologic Engineering Center, Corps of Engineers, March 1967.

3. Storm Report, March 8, 1968, Department of Special District Services, Flood Control Division, County of San Diego, July 1968.

4. A Special Study of Storm Drainage Facilities, A Supplement to the Chula Vista General Plan, Lawrence, Fogg, Florer, and Smith, Civil Engineers, La Mesa, California, June 1964.

5. Hydrology for Flood Insurance Studies, Murphy, Murray, Alvarado, and Tecolote Canyons, San Diego County, California, U.S. Army Engineer District, Los Angeles, Corps of Engineers, 4 April 1973.

6. Hydrology for Flood Insurance Studies, Spring Valley Creek, San Diego County, California, U.S. Army Engineer District, Los Angeles, Corps of Engineers, 20 June 1973.

7. Hydrology for Flood Insurance Studies, Chollas Valley, San Diego County, California, U.S. Army Engineer District, Los Angeles, 13 September 1972.

8. San Diego River (Mission Valley), Design Memorandum No. 1, Hydrology, U.S. Army Engineer District, Los Angeles, Corps of Engineers, July 1975.

TABLE I

PEAK DISCHARGE FREQUENCY VALUES FOR PRESENT (1984) CONDITIONS

C.P.	Location	D.A. Sq. Mi.	Discharge in cfs Exceedance Interval SPF	100-year	50-year	25-year	10-year	5-year	2-year
	TELEGRAPH CANYON CREEK:								
1.	I-5 culvert flow	7.3	1,800	1,600	1,500	1,500	900	550	250
1A	Immediately above I-5	7.3	5,500 (6,200)	2,800 (3,100)	2,100 (2,300)	1,500 (1,700)	900 (900)	550 (550)	250 (250)
2	At Hilltop	5.5	4,700	2,200	1,600	1,100	600	400	150
3	At I-805	4.9	4,600	2,100	1,500	1,000	600	400	150
4	Near BM 502	3.2	3,800	1,700	1,200	800	450	300	100
5	Near Cocakatoo Grove	1.6	2,600	1,200	850	550	350	200	100

Note: Value in parenthesis is discharge assuming Corps project constructed.

TABLE 2

PEAK DISCHARGE FREQUENCY VALUES FOR FUTURE (1990) CONDITIONS

C.P.	Location	D.A. Sq. Mi.	Discharge in cfs Exceedence Interval SPF	100-year	50-year	25-year	10-year	5-year	2-year
	TELEGRAPH CANYON CREEK:								
1.	I-5 culvert flow	7.5	1,900	1,700	1,500	1,500	1,000	650	300
1A	Immediately above I-5	7.3	5,800 (6,800)	3,100 (3,300)	2,400 (2,500)	1,700 (1,700)	1,000 (1,000)	650 (650)	300 (300)
2	At Hilltop	5.5	5,100	2,400	1,700	1,200	800	500	250
3	At I-805	4.9	5,000	2,300	1,600	1,100	800	500	250
4	Near BM 502	3.2	4,100	2,000	1,300	900	650	400	200
5	Near Cocakatoo Grove	1.6	2,700	1,300	900	600	400	250	100

Note: Value in parenthesis is discharge assuming Corps project constructed.

TABLE 3

PEAK DISCHARGE FREQUENCY VALUES FOR ULTIMATE CONDITIONS

C.P.	Location	D.A. Sq.Mi.	Discharge in cfs Exceedence Interval SPF	100-year	50-year	25-year	10-year	5-year	2-year
	TELEGRAPH CANYON CREEK:								
1A	Immediately above I-5	7.3	6,000 (7,000)	3,300 (3,500)	2,600 (2,700)	1,900 (1,900)	1,200 (1,200)	800 (800)	400 (400)
2	At Hilltop	5.5	5,800	3,000	2,200	1,700	1,100	800	400
3	At I-805	4.9	5,800	3,000	2,200	1,700	1,100	800	400
4	Near BM 502	3.2	4,400	2,300	1,700	1,300	800	600	300
5	Near Cocakatoo Grove	1.6	3,100	1,600	1,200	900	600	400	200

Note: Value in parenthesis is discharge assuming Corps project constructed.

TABLE 4

BASIN CHARACTERISTICS

Subarea	D.A. (sq.mi.)	L (Mi.)	Lea (Mi.)	Slope (Ft./Mi.)	n Value			Impervious Cover		
					Present	Future	Ultimate	Present (%)	Future (%)	Ultimate (%)
A	1.57	2.06	1.01	160	0.030	0.025	0.020	5	25	45
B	1.60	2.17	1.16	113	0.030	0.025	0.020	5	25	45
C	1.73	2.46	1.49	102	0.030	0.025	0.020	5	25	45
D	0.65	1.25	0.59	84	0.020	0.020	0.020	45	45	45
DE	2.37	3.69	1.84	60	0.020	0.020	0.020	45	45	45

TABLE 5

PRECIPITATION SUMMARY AT CHULA VISTA AND OTAY RANCH

Month	Mean Monthly	
	Otay Ranch* (Inches)	Chula Vista (Inches
January	1.89	1.64
February	1.49	1.27
March	1.77	1.55
April	1.12	0.91
May	0.23	0.17
June	0.07	0.05
July	0.02	0.02
August	0.09	0.07
September	0.18	0.12
October	0.37	0.35
November	1.40	1.18
December	1.75	1.57
Annual Mean	10.38	8.90

* Data provided by Otay Ranch

TABLE 6

History of Storms and Floods
Telegraph Canyon and Vicinity

Year	Description
1825	Dates: Not known Precipitation: Not known Peak Discharges: Not known Flood changed outlet of San Diego River from Mission Bay to San Diego Bay.
1862	Dates: Precipitation: Daily values not available. Heaviest storm reported to have occurred near end of month. Monthly total at San Diego 5.56 inches, with much heavier rainfall reported to have fallen in the mountains.
1889	Dates: 12-13 October. Precipitation: 7.58 inches in 8 hours at Encinitas, a coastal town about 25 miles north of San Diego; 0.44 inches at Los Angeles; 0.04 inches at San Diego. Peak Discharges: No reports available. One dam near Encinitas is reported to have given way. Storm consisted on an intense, prolonged thunderstorm. No depth-area or time distribution available.
1916	See paragraph 3-02.
1921	Dates: 18-27 December, in two portions: 18-22 and 24-26 December. Precipitation: From 8 inches along south coast to 27 inches in the mountains, with from 5 inches (coast) to 18 inches (mountains) from 18 to 22 December. Peak Discharge: 16,700 c.f.s. on San Diego River at Santee, measured by U.S.G.S. on December. Generally heavy rainfall 18-22 December, letting up, then increasing again, with intense rainfall 25-26 December. High snow levels.

TABLE 6 (Continued)

Year	Description
1927	See paragraph 3-03.
1937	Dates: 5-7 February. Duration approximately 36 hours. Precipitation: From 2 inches along south coast to 13 inches in the mountains, with about 85% of this within maximum 24 hours. Peak Discharge: 14,200 c.f.s. on San Diego River at Santee, measured by U.S.G.S. on February.
1938	Dates: 26 February - 3 March. Precipitation: From less than 3 inches along south coast to 17 inches in the mountains, with about two-thirds of this falling within 48 hours. Peak Discharge: 7,350 c.f.s. on San Diego River at Santee, recorded by U.S.G.S. on March. Precipitation generally moderate and intermittent 26 February - 1 March. After rainless period of about 18 hours, heavy rainfall until 3 March, with greatest intensities on 2 March.
1943	See paragraph 3-04.
1965	Dates: 22-26 November. Precipitation: From less than 3 inches along portions of the coast to nearly 13 inches in the mountains. Peak Discharge: 1,350 c.f.s. on Alvarado Canyon Creek at Waring Road and Interstate 8 - its greatest flow of record ___ and 530 c.f.s. on Spring Valley Creek at Goodland Acres Park ___ both on 22 November. Heaviest precipitation occurred on 22 and 23 November.
1965	Dates: 9-16 December. Precipitation: From 2 to 3 inches most of western San Diego County to 5.59 inches at Cuyamaca and 5.87 inches at San Diego Airport. This airport total included a very localized 1.36-inch cloudburst on morning of 10 December. Peak Discharge: 2,100 c.f.s. on Tecolote Creek at Morena Blvd., recorded on 10 December - the greatest of record.

TABLE 6 (Continued)

Year	Description
	Since only two weeks had passed since the heavy November 1965 storms, ground conditions were generally favorable for runoff, despite the rather modest December storm totals.
1966	Dates: 3-7 December. Precipitation: From 1.94 inches at Chula Vista to 17.43 inches Cuyamaca, with heaviest amounts generally on 5 and 6 December. Peak Discharges: The highest discharges for the water year on streams in the study area generally recorded on 5 or 6 December, including 1,200 c.f.s. on Las Chollas Creek at Wabash and Oceanview, 1,150 c.f.s. on Alvarado Canyon Creek at Waring Road and Interstate 8, 850 c.f.s. on Tecolote Creek at Morena Blvd., 480 c.f.s. on Spring Valley Creek at Goodland Acres Park and 450 c.f.s. on South Las Chollas Creek tributary at Euclid Avenue and Market Street.
1968	See paragraph 3-05.
1969	Dates: 13-15 January. Precipitation: From less than 1 inch north coast to nearly 4 inches southern mountains, including 0.75 inch in 1 hour at County Operations Center, Kearny Mesa. Peak Discharges: 1,400 c.f.s. on Forester Creek at Cuyamaca Street; 1,200 c.f.s. on Las Chollas Creek at Wabash and Oceanview; 630 c.f.s. on Tecolote Creek at Morena Blvd; 270 c.f.s. on Spring Valley Creek at Goodland Acres Park. Flooding generally local and minor, with light to moderate runoff except on a few local creeks.
1969	Dates: 24-26 January. Precipitation: From less than 1 inch along the coast to 11.73 at Palomar Observatory, with heaviest intensities mid-day 25 January and a brief heavy period on 26 January - the latter icluding 0.90 inch in 1 hour at Cuyamaca. Peak Discharge: 2,040 c.f.s. recorded on Las Chollas Creek at Wabash and Oceanview on 25 January. Generally light to moderate rain San Diego County, with generally moderate runoff but some local flooding. Over mush of central and southern California the storm period of 18-26 January 1969 was one of the most severe of record.

TABLE 6 (Continued)

Year	Description
1969	Dates: 5-7 February. Precipitation: Less than 1 inch along south coast to 3-4 inches in mountains, mostly within a few hours on morning of 6 February. Some snow higher elevations. Peak Discharges: 1,400 c.f.s. on Forester Creek at Cuyamaca Street; 430 c.f.s. on Murphy Canyon Creek at Clairemount Mesa Blvd.
1969	Dates: 24-26 February. Precipitation: Less than 1 inch along extreme south coast; 6 inches at several northern San Diego County valley stations; up to 14 inches estimated over higher mountains. Heaviest precipitation late 26 February. Peak Discharges: 1,150 c.f.s. on Las Chollas Creek at Wabash and Oceanview; 700 c.f.s. on Alvarado Canyon Creek at Waring Road and Interstate 8; 250 c.f.s. on South Las Chollas Creek Tributary at Euclid Avenue and Market Street. Storm followed more than a month of recurring rain. Ground conditions very favorable for runoff.
1974	Date: 4 December. Precipitation: Generally 1 to 1.5 inches in coastal portion of County by noon, with over 2 inches in the northern mountains. More than 2 inches also fell along a narrow belt extending from the vicinity of Mission Beach eastward to El Cajon, apparently as the result of a local thunderstorm which dropped 1.7 inches in 1 hour at Point Loma. Peak Discharges: 2,500 c.f.s. on Forester Creek at Mission Gorge Road; 330 c.f.s. on Murphy Canyon; 2,130 c.f.s. on Alvarado Canyon Creek at Waring Road; 515 c.f.s. on South Las Chollas Creek at Lennox Avenue.
1975	Dates: 8-9 April. Precipitation: Average of 1.5 inches north and central coastal portion of County in 48 hours, with about 1 inch in southern coastal areas. A few apparent intense short-duration cloudbursts in some areas. Peak Discharges: 500 c.f.s. recorded on Spring Valley Creek at Goodland Acres Park; 1,000 c.f.s. estimated on Forester Creek at Cuyamaca Street.

TABLE 7

Stream Gages and Storms
Used in Flood Reconstitutions

Stream Gage Name	Gage No.**	Drainage Area (sq. mi.)	Storm	Date	Peak Discharge (cfs)
Pauma Creek near Pauma Valley	GS-0377	11.0	2-6 Dec 23-26 Feb	1966 1969	2,100 1,420
San Diego River near Santee	GS-0225	377.0	25-29 Jan 25-27 Dec	1916 1921	70,200 16,700
San Vicente Creek at Foster*	GS-0220	75	6-7 Feb	1937	9,400
Forester Creek at Cuyamaca Street	SD-565	23.4	13-15 Jan	1969	1,250
West Fork San Luis Rey River near Warner Springs	GS-0330	25.5	2-6 Dec 23-26 Jan	1966 1969	4,200 3,900
Guejito Creek near San Pasqual	GS-0270	22.5	6 Dec 23-26 Jan	1966 1969	2,920 2,100
Spring Valley Creek at Goodland Acres Park	SD-560	4.36	6 Dec 8-9 Mar 1-2 Mar 4 Mar 21 Dec	1966 1968 1970 1970 1970	364 435 365 295 269
Cristanitos Creek near San Clemente	GS-0463.5	29.0	23-26 Jan	1969	1,350
San Onofre Creek at San Onofre	GS-0462.5	42.2	23-26 Jan	1969	1,830
De Luz Creek near Fallbrook	GS-0449	47.5	23-26 Jan	1969	4,700
San Mateo Creek near San Clemente	GS-0463	80.8	23-26 Jan	1969	6,600

* After 1941 called San Vicente Creek at San Vicente Dam, at Foster.
** GS – USGS gage number.
SD – San Diego County Flood Control District gage number.

TABLE 8

Best-Fit Loss Rate and Unit Hydrograph Parameters For Flood Reconstitutions

No.	Gage	Date	HEC Loss Function Parameters*** STRKR	ERAIN	DLTKR	RTIOL	Clark Unit Hydrograph Parameter*** TC	R	TC+R	$\frac{R}{TC+R}$	$\frac{TC}{R}$	Antecedent Rainfall (inches)
1	PC near PV	12/2-6/66	0.65	0	2.0	3	2.58	5.03	7.61	0.66	0.51	3
2	PC near PV	2/23-26/69	0.21	0	3.5	3	1.07	5.6	6.67	0.84	0.19	2
3	SDR near SA	1/25-29/16	0.06	0	0.15	3	19.19	3.34	22.53	0.15	5.75	12
4	SDR near SA	12/25-27/21	0.50	0	0.50	3	6.97	12.31	19.28	0.64	0.57	10
5	SVC at FO	2/6-7/37	0.38	0	2.11	3	3.08	7.24	10.32	0.70	0.43	2
6	FC at CS*	1/13-15/69	0.15	0	0.25	3	1.04	4.07	5.11	0.80	0.26	2
7	SLR near WS	12/2-6/66	0.60	0	1.0	3	1.03	6.49	7.52	0.86	0.16	3
8	SLR near WS	1/23-26/69	0.41	0	3.0	3	9.11	1.48	10.59	0.14	6.16	6
9	GC near SP	12/6/66	0.04	0	0.70	3	2.58	0.52	3.10	0.17	4.96	4
10	GC near SP	1/23-26/69	0.19	0	0.50	3	1.03	5.63	6.66	0.85	0.18	3
11	SVC at GAP*	12/6/66	0.30	0	1.31	3	1.44	2.82	4.26	0.66	0.51	4
12	SVC at GAP*	3/8-9/68	0.19	0	1.33	3	1.03	0.48	1.51	0.32	2.15	Trace
13	SVC at GAP*	3/1/70	0.14	0	3.50	3	1.66	.52	2.18	0.24	3.19	1.6
14	SVC at GAP*	3/4/70	0.07	0	0.29	3	1.03	0.47	1.50	0.31	2.19	3
15	SVC at GAP*	12/21/70	0.31	0	2.0	3	1.53	0.53	2.06	0.26	2.89	1
16	CC near SC	1/23-26/69	0.54	0	1.0	3	5.94	0.64	6.58	0.10	9.28	3
17	SOC at So	1/23-26/69	0.37	0	2.0	3	8.28	1.21	9.49	0.13	6.84	3
18	DLC near FA	1/23-26/69	0.44	0	1.5	3	3.76	1.78	5.54	0.32	2.11	3
19	SMC near SC	1/23-26/69	0.54	0	3.0	3	6.0	4.51	10.51	0.43	1.33	3

PC – Pauma Creek
PV – Pauma Valley
SDR – San Diego River
SA – Santee
SVC – San Vicente Creek
FO – Foster
FC – Forester Creek
CS – Cuyamaca Street
SLR – West Fork San Luis Rey River
GC – Guejito Creek
SP – San Pasqual
SVC – Spring Valley Creek
GAP – Goodland Acres Park
CC – Cristanitos Creek
SC – San Clemente
SOC – San Onofre Creek
SO – San Onofre
DLC – De Luz Creek
FA – Fallbrook
SMC – San Mateo Creek

* Significant urbanization.
** The HEC loss function parameters represent a mathematical function as defined below:
STRKR – Starting value of rainfall loss coefficient.
DLTKR – Initial accumulated rain loss during which loss coefficient is increased.
RTIOL – Ratio for rainfall loss coefficient of loss function.
ERAIN – Exponent for precipitation in rain loss function.
*** The Clark unit hydrograph parameters are time of concentration (TC) and the storage coefficient (R).

TABLE 9

MUSKINGUM ROUTING COEFFICIENTS

Channel Reach *	Number of Reaches**	Without Project K	Project X	Number of Reaches	With Project K	Project X
5R4	2	.25	0.25	2	0.25	0.25
4R3	2	.25	0.25	2	0.25	0.25
3R2	1	.25	0.30	1	0.25	0.30
3R1	3	.25	0.20	2	0.25	0.30

* This symbolizes the reach from concentration point "A" to concentration point "B". (ARB)

**Number of successive reaches to be routed with identical routing specifications.

Table 10
Flood routing through existing culvert at Interstate 5
(Present and future conditions)

Return period	Peak discharge (c.f.s.)	Total inflow volume (ac-ft)	Peak outflow thru I-5 culvert (c.f.s.)	Storage volume ponding area above culvert (ac-ft)	Maximum water surface area above culvert (ft)	Peak outflow to ponding area north of L Street	Storage volume ponding area north of L Street	Maximum water surface elevation ponding area north of L Street
				Present conditions without project				
SPF	5500	1046	1800	18.3	33.4	3400	320	26.6
100-yr	2800	507	1600	9.3	31.1	1100	82	22.9
60-yr	2200	401	1500	8.2	30.7	490	39	21.2
				Future conditions without project				
SPF	5800	1073	1900	26.8	34.2	3800	366	27.1
100-yr	3100	520	1700	11.1	31.7	1400	99	23.3
				Present conditions with project				
SPF	6800	1046	3400	33.8	35.1	3700	171	24.6
				Future conditions with project				
SPF		1073	3400	36.1	35.2	4100	217	25.3

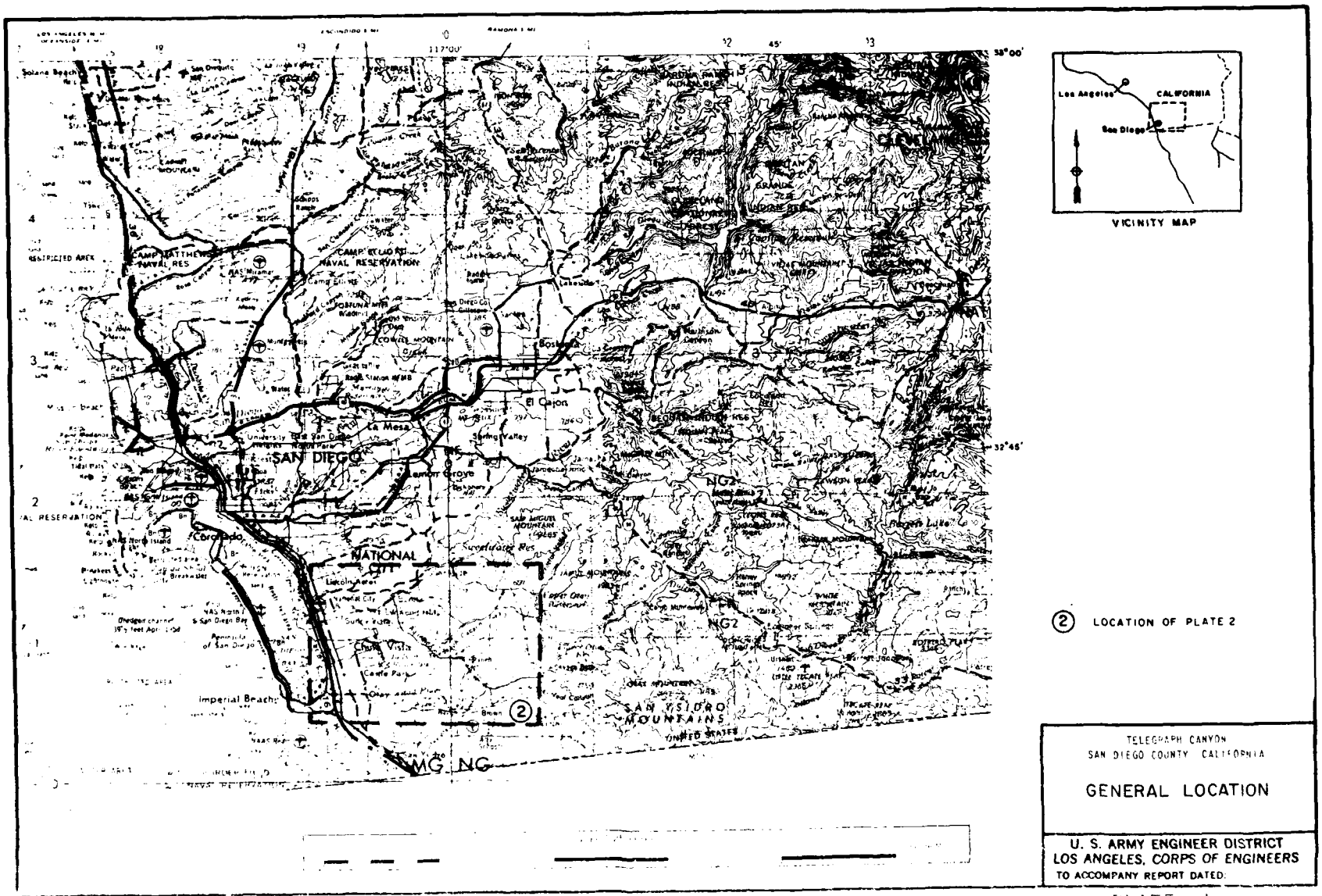
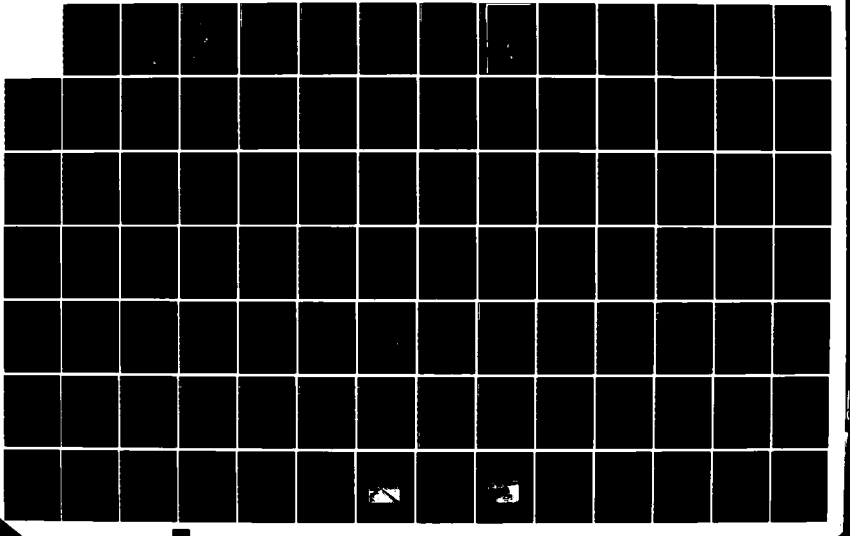
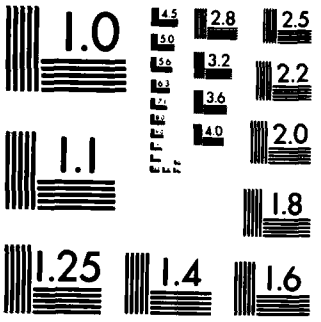

SAN DIEGO
El Cajon
La Mesa
NATIONAL CITY
Coronado
Imperial Beach
SAN YSIDRO MOUNTAINS
CAMP MATTHEWS NAVAL RES
CAMP ELLIOTT NAVAL RESERVATION
NG2
NG
117°00'
32°45'
38°00'
Los Angeles
CALIFORNIA
San Diego
VICINITY MAP
② LOCATION OF PLATE 2
TELEGRAPH CANYON
SAN DIEGO COUNTY CALIFORNIA
GENERAL LOCATION
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE 1

AD-A150 164 TELEGRAPH CANYON CREEK CITY OF CHULA VISTA SAN DIEGO COUNTY CALIFORNIA DE..(U) ARMY ENGINEER DISTRICT LOS ANGELES CA JUL 83 2/3

UNCLASSIFIED F/G 13/2 NL





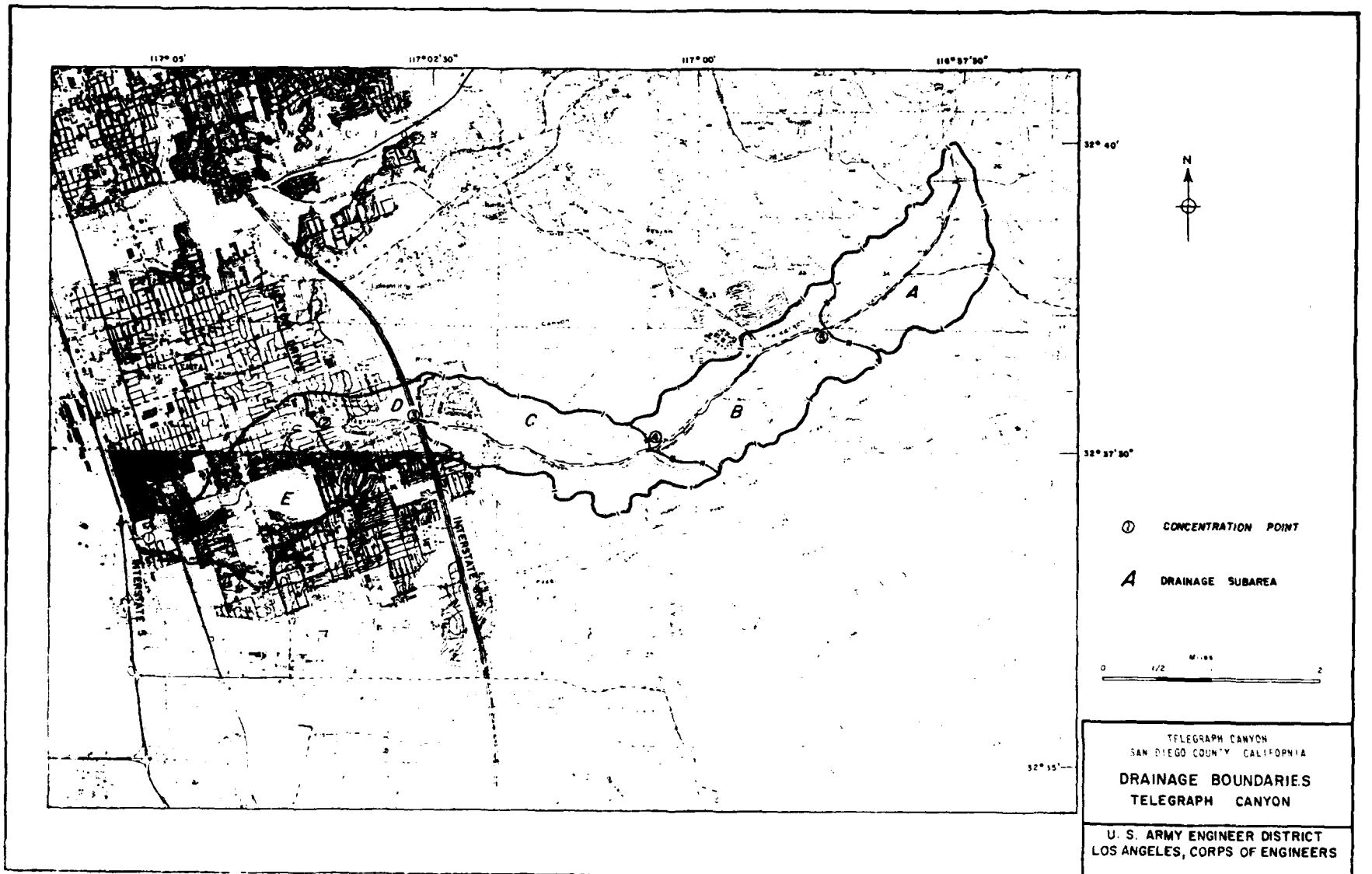
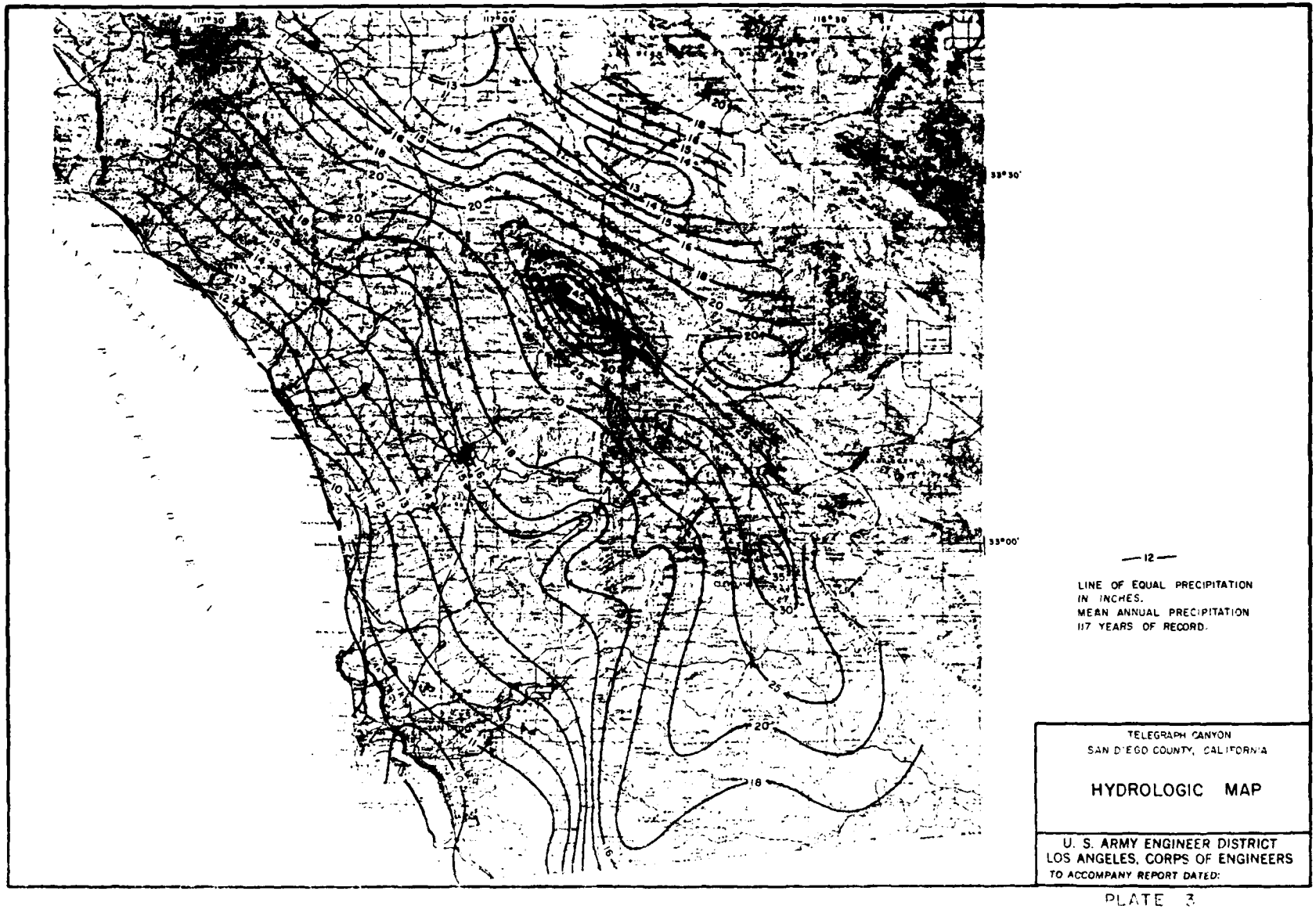

117° 05'
117° 02' 30"
117° 00'
116° 57' 30"
32° 40'
32° 37' 30"
32° 35'
N
A
B
C
D
E
INTERSTATE 5
INTERSTATE 805
① CONCENTRATION POINT
A DRAINAGE SUBAREA
0
1/2
2
TELEGRAPH CANYON
SAN DIEGO COUNTY CALIFORNIA
DRAINAGE BOUNDARIES
TELEGRAPH CANYON
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 2



—12—

LINE OF EQUAL PRECIPITATION
IN INCHES.
MEAN ANNUAL PRECIPITATION
117 YEARS OF RECORD.

TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

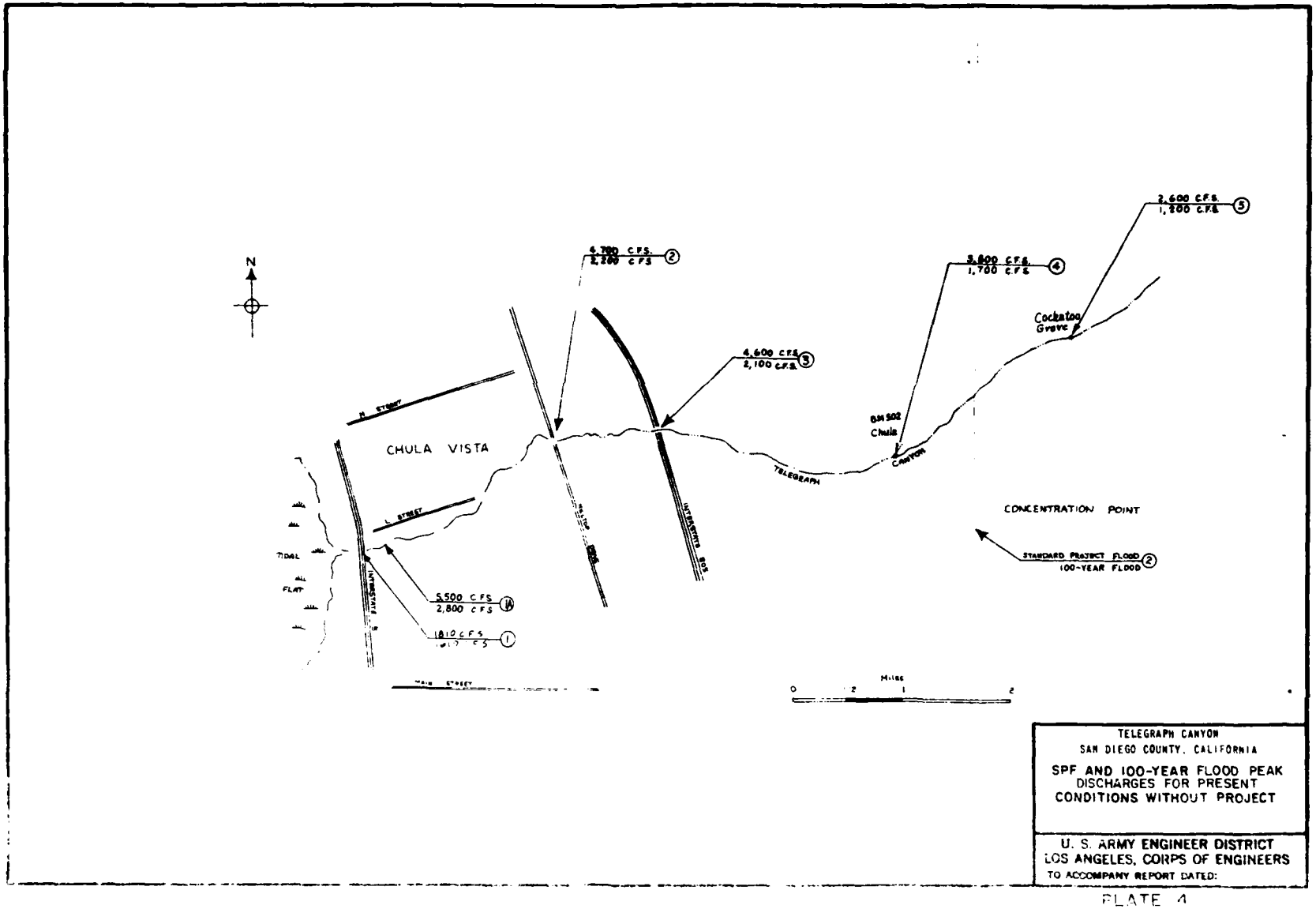
HYDROLOGIC MAP

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE 3

U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

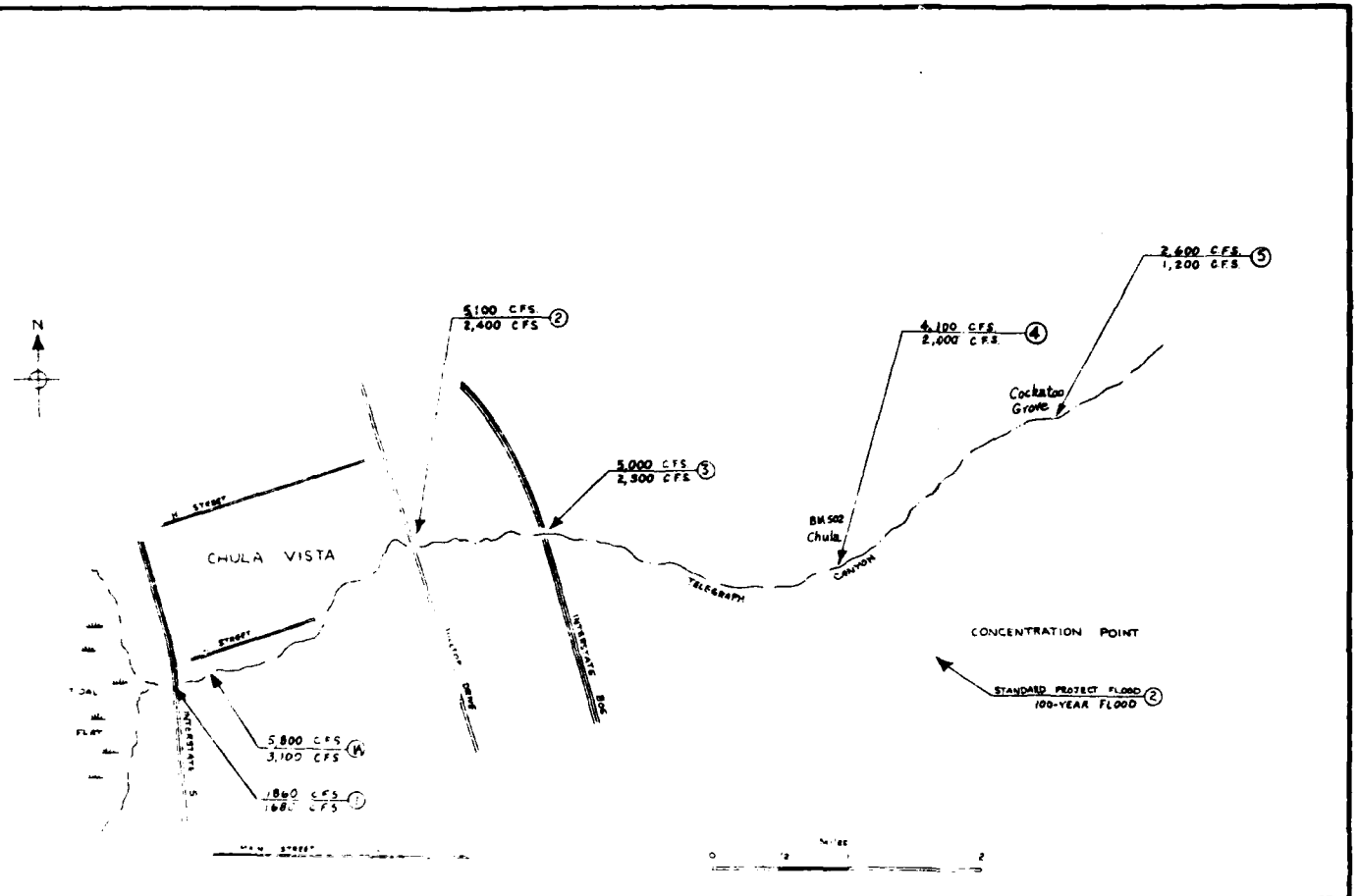
SPF AND 100-YEAR FLOOD PEAK DISCHARGES FOR PRESENT CONDITIONS WITHOUT PROJECT

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE 4

U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



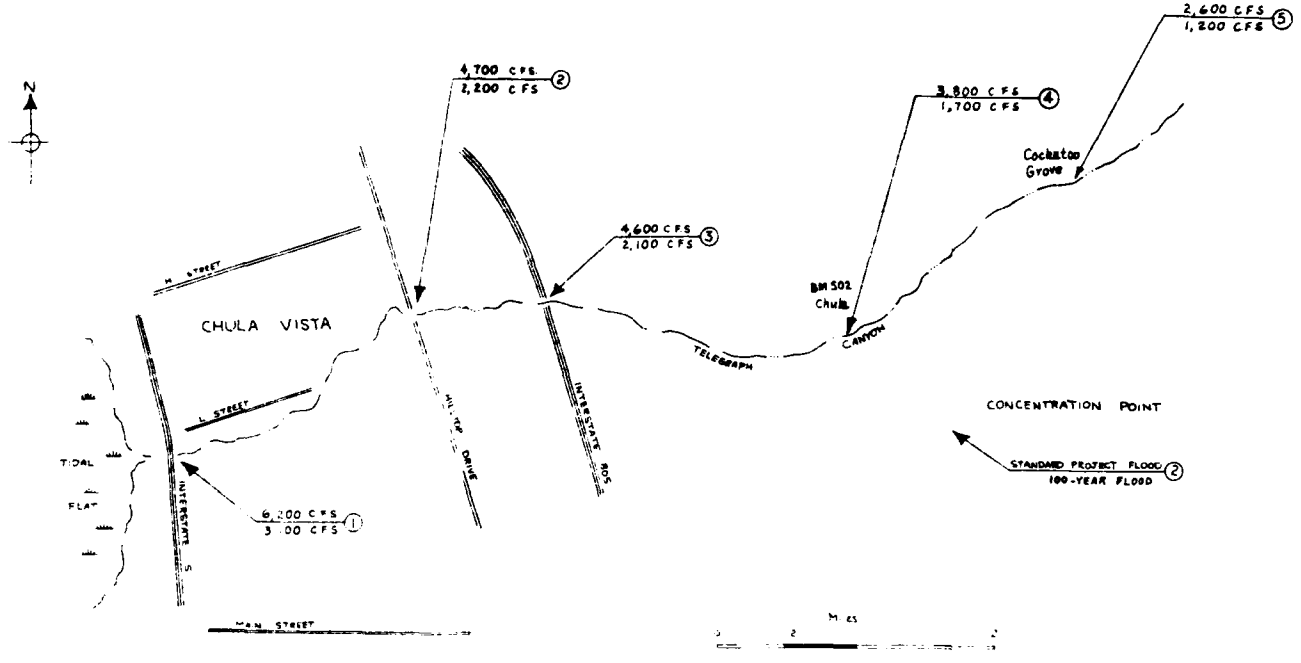
TELEGRAPH CANYON

SAN DIEGO COUNTY, CALIFORNIA

SPF AND 100-YEAR FLOOD PEAK DISCHARGES FOR FUTURE CONDITIONS WITHOUT PROJECT

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE F



TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

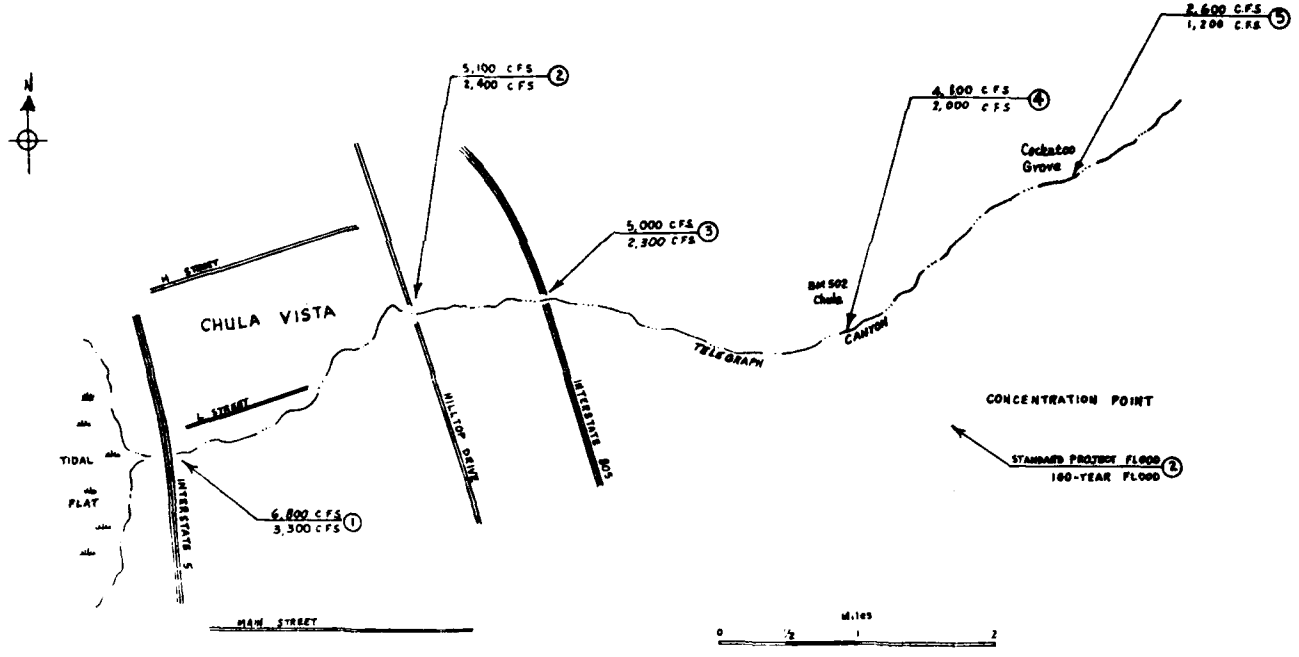
SPF AND 100-YEAR FLOOD PEAK DISCHARGE FOR PRESENT CONDITIONS WITH PROJECT

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE 6

U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

SPF AND 100-YEAR FLOOD PEAK DISCHARGE FOR FUTURE CONDITIONS WITH PROJECT

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED

PLATE 7

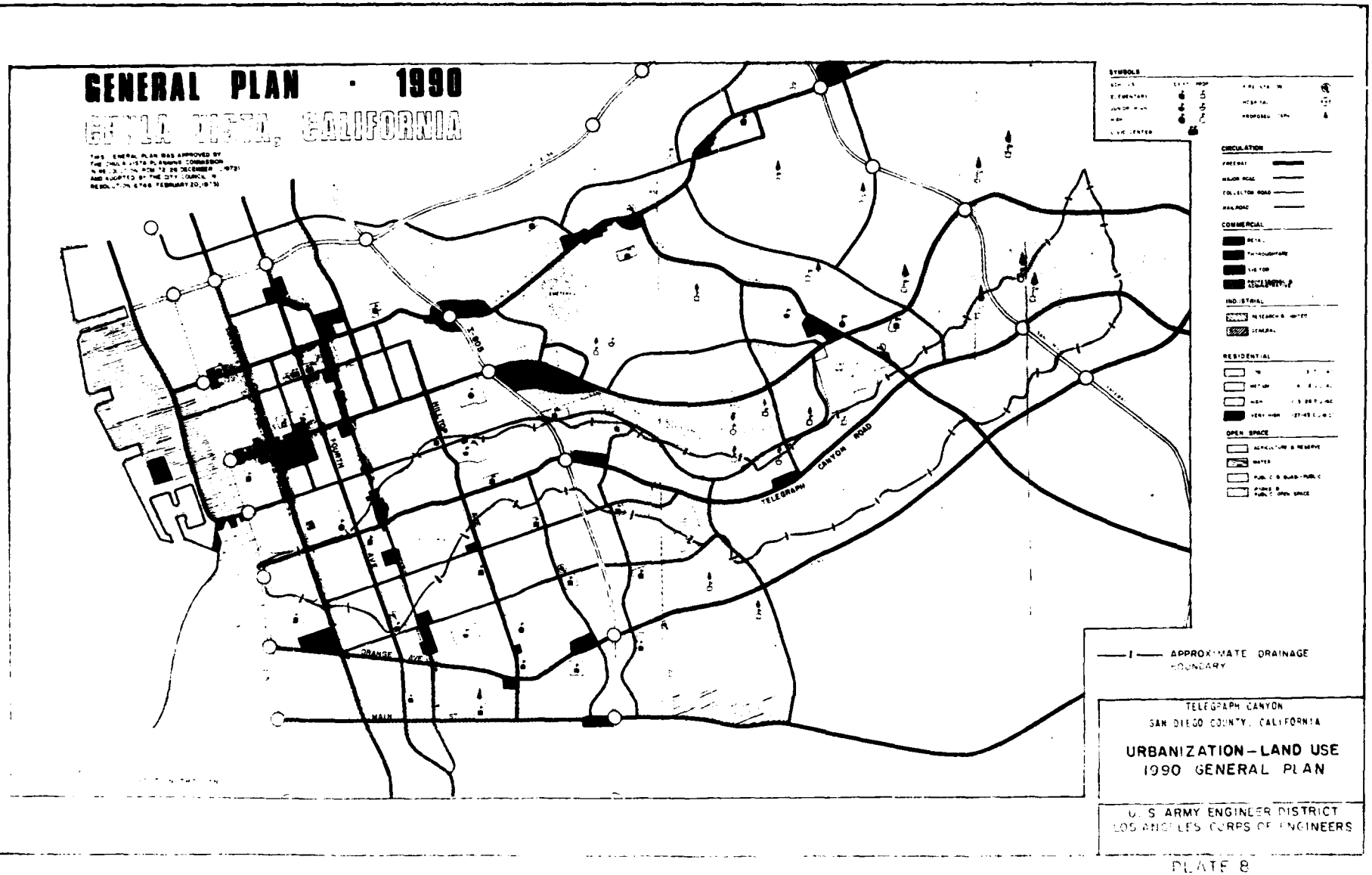
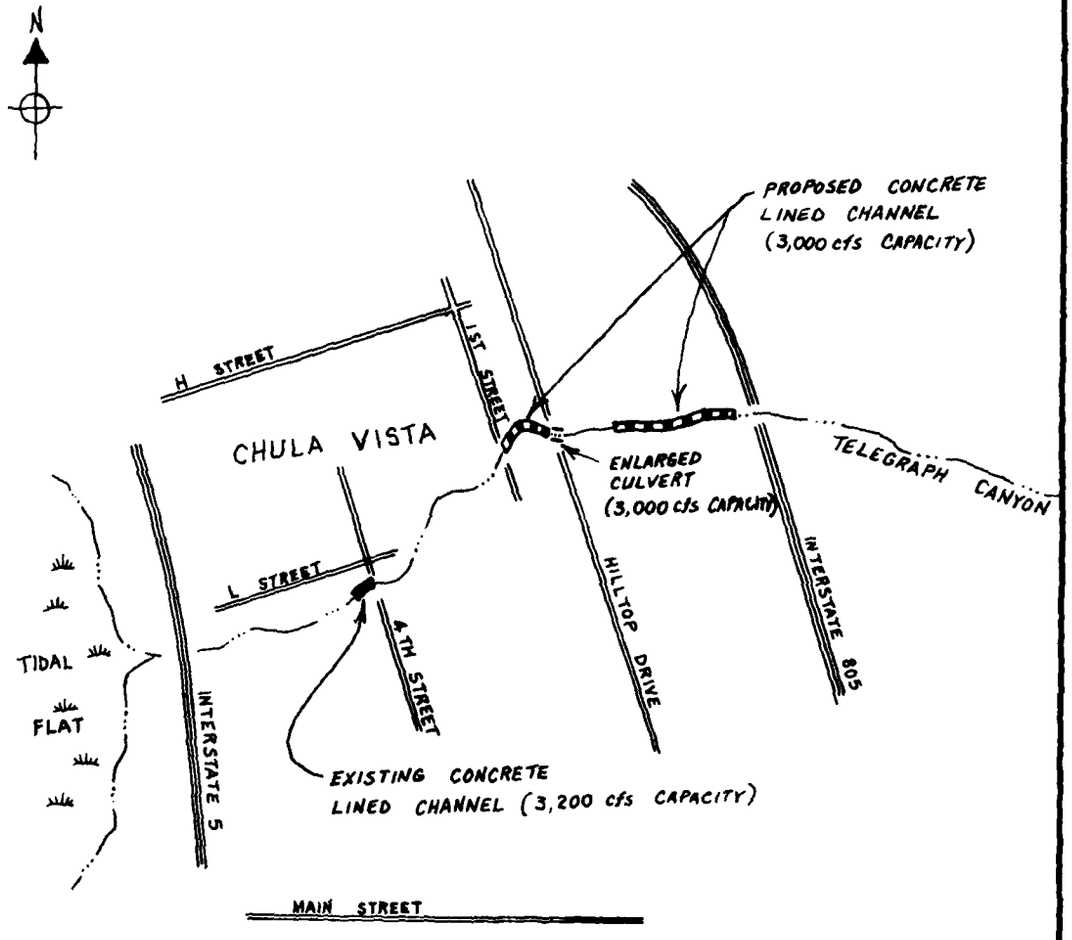

GENERAL PLAN · 1990
SYMBOLS
CIRCULATION
COMMERCIAL
INDUSTRIAL
RESIDENTIAL
OPEN SPACE
TELEGRAPH CANYON ROAD
ORANGE AVE.
MAIN ST.
APPROXIMATE DRAINAGE BOUNDARY
TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA
URBANIZATION – LAND USE
1990 GENERAL PLAN
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES CORPS OF ENGINEERS

PLATE 8



LEGEND

EXISTING CONCRETE LINED CHANNEL

PROPOSED CONCRETE LINED CHANNEL

= ENLARGED CULVERT

Miles

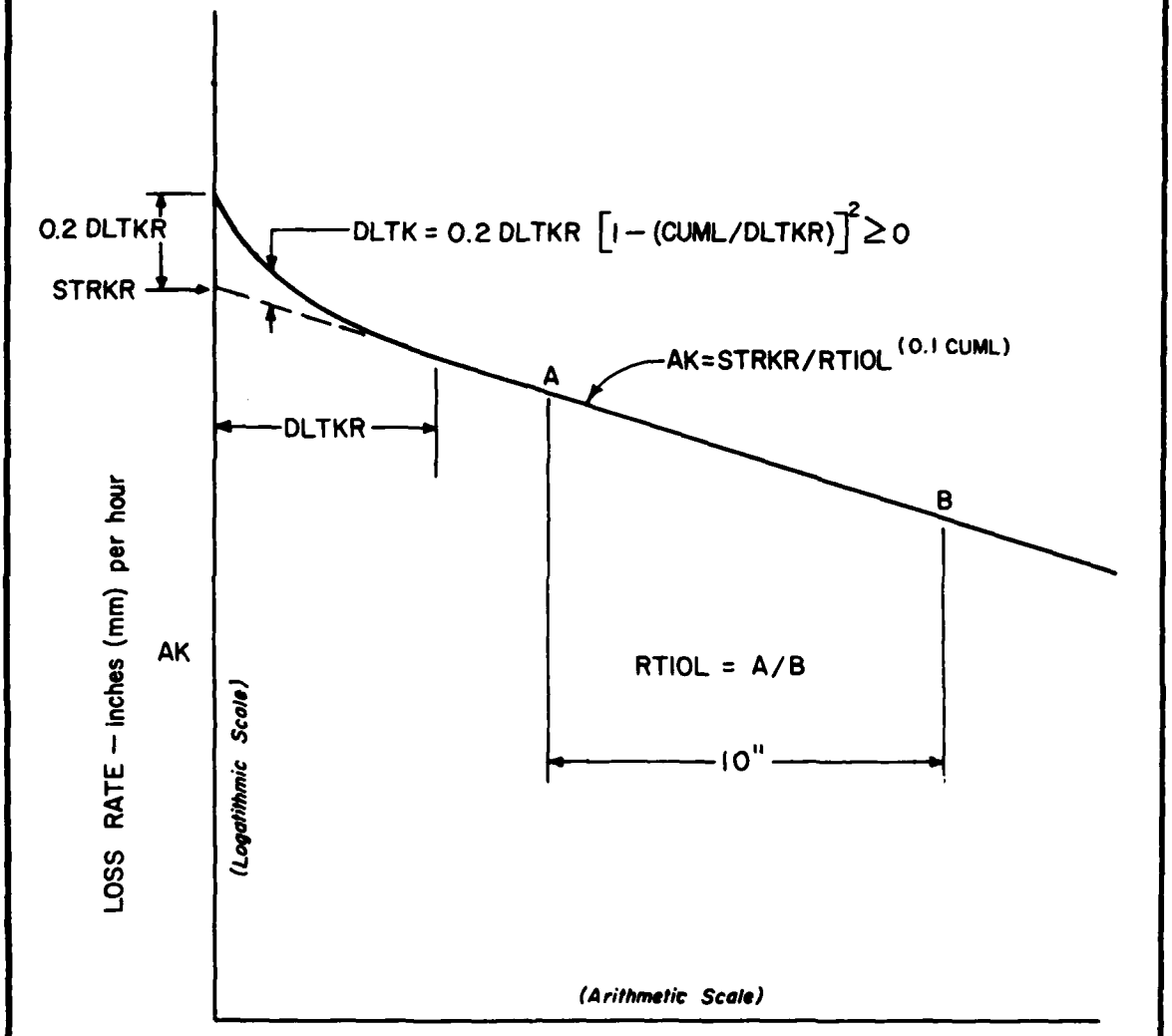
0 ½ 1 2

TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

EXISTING AND PLANNED LOCAL IMPROVEMENTS

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 9



NOTE: DEFINITIONS OF VARIABLES GIVEN IN REFERENCE 1.

TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

H.E.C. LOSS RATE FUNCTION

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 10

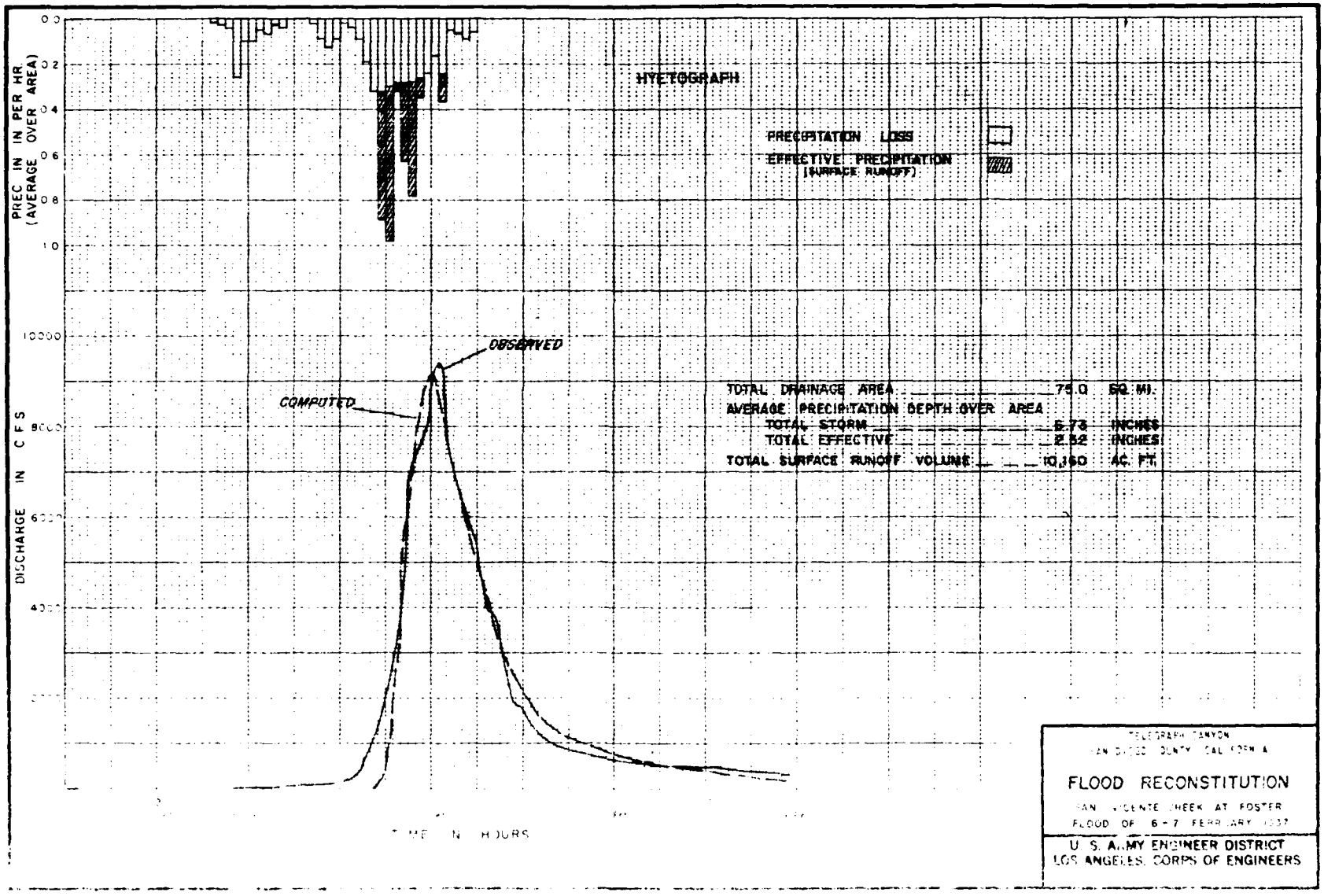
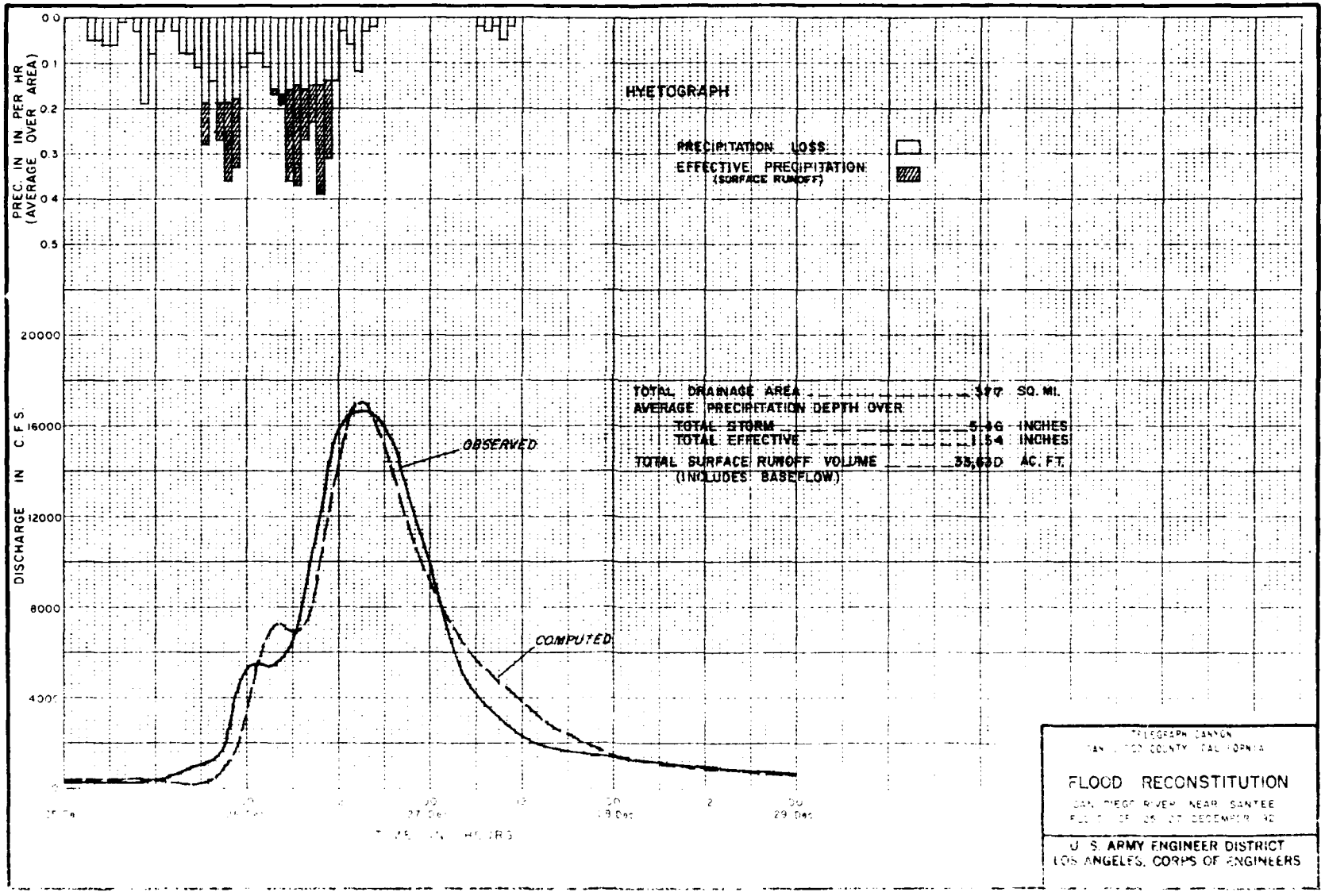
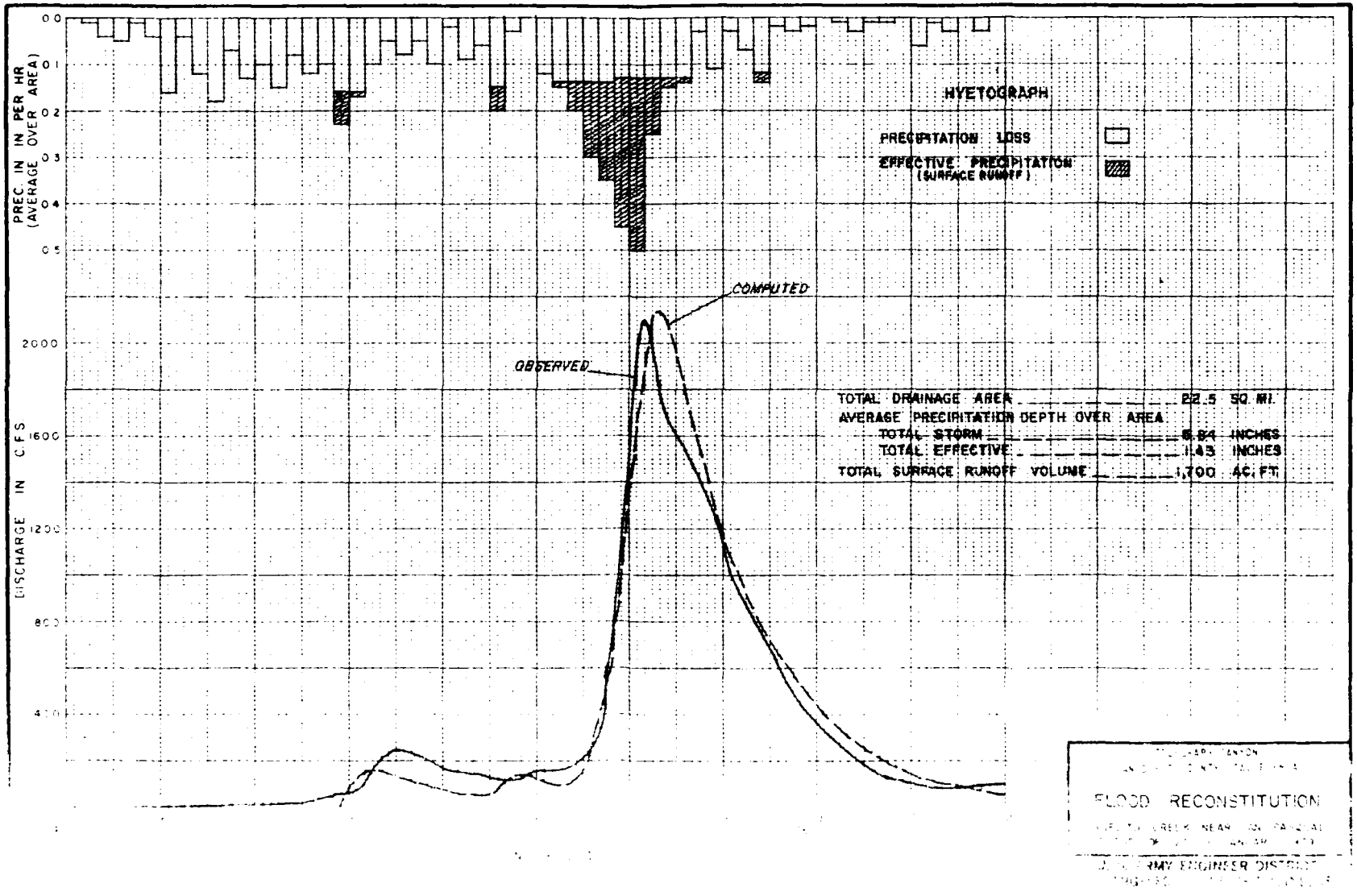
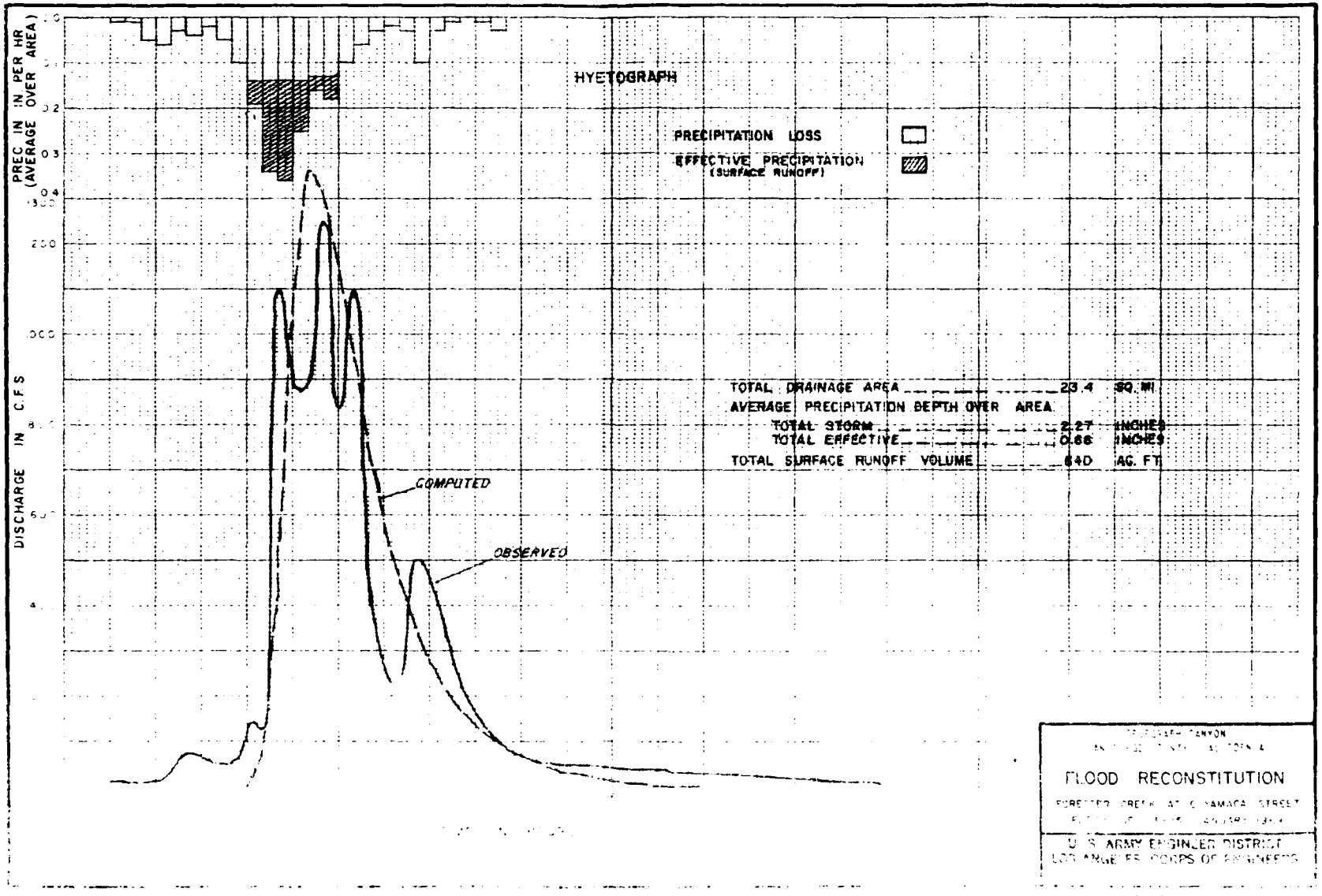

HYETOGRAPH
PRECIPITATION LOSS
EFFECTIVE PRECIPITATION (SURFACE RUNOFF)
PREC IN IN PER HR (AVERAGE OVER AREA)
0.0
0.2
0.4
0.6
0.8
1.0
DISCHARGE IN C F S
10000
8000
6000
4000
OBSERVED
COMPUTED
TIME IN HOURS
TOTAL DRAINAGE AREA ..... 75.0 SQ. MI.
AVERAGE PRECIPITATION DEPTH OVER AREA
TOTAL STORM ..... 5.73 INCHES
TOTAL EFFECTIVE ..... 2.52 INCHES
TOTAL SURFACE RUNOFF VOLUME ..... 10,160 AC. FT.
TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA
FLOOD RECONSTITUTION
SAN VICENTE CREEK AT FOSTER
FLOOD OF 6-7 FEBRUARY 1937
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 1


PREC. IN IN PER HR (AVERAGE OVER AREA)
0.0
0.1
0.2
0.3
0.4
0.5
HYETOGRAPH
PRECIPITATION LOSS
EFFECTIVE PRECIPITATION (SURFACE RUNOFF)
DISCHARGE IN C.F.S.
20000
16000
12000
8000
4000
OBSERVED
COMPUTED
TOTAL DRAINAGE AREA ..... 377 SQ. MI.
AVERAGE PRECIPITATION DEPTH OVER
TOTAL STORM ..... 5.86 INCHES
TOTAL EFFECTIVE ..... 1.54 INCHES
TOTAL SURFACE RUNOFF VOLUME ..... 35,630 AC. FT.
(INCLUDES BASEFLOW)
TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA
FLOOD RECONSTITUTION
SAN DIEGO RIVER NEAR SANTEE
FLOOD OF 26-27 DECEMBER 40
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE


PREC IN IN PER HR (AVERAGE OVER AREA)
0.0
0.1
0.2
0.3
0.4
0.5
DISCHARGE IN C.F.S
2000
1600
1200
800
400
HYETOGRAPH
PRECIPITATION LOSS
EFFECTIVE PRECIPITATION (SURFACE RUNOFF)
COMPUTED
OBSERVED
TOTAL DRAINAGE AREA ..... 22.5 SQ MI.
AVERAGE PRECIPITATION DEPTH OVER AREA
TOTAL STORM ..... 5.84 INCHES
TOTAL EFFECTIVE ..... 1.43 INCHES
TOTAL SURFACE RUNOFF VOLUME ..... 1,700 AC. FT.
FLOOD RECONSTITUTION
ARMY ENGINEER DISTRICT


HYETOGRAPH
PRECIPITATION LOSS
EFFECTIVE PRECIPITATION (SURFACE RUNOFF)
PREC IN IN PER HR (AVERAGE OVER AREA)
DISCHARGE IN C.F.S
COMPUTED
OBSERVED
TOTAL DRAINAGE AREA 23.4 SQ. MI
AVERAGE PRECIPITATION DEPTH OVER AREA
TOTAL STORM 2.27 INCHES
TOTAL EFFECTIVE 0.66 INCHES
TOTAL SURFACE RUNOFF VOLUME 840 AC. FT
FLOOD RECONSTITUTION
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES CORPS OF ENGINEERS

		CONTRIBUTING AREA	L	L_{ca}	S	LAG	ESTIMATED R
		SQ MI	MILES	MILES	FT/MI	HOURS	
1.	SAN GABRIEL RIVER AT SAN GABRIEL DAM	162.0	23.2	11.6	350	3.3	0.080
2.	WEST FORK SAN GABRIEL RIVER AT COGSWELL DAM	40.4	9.3	4.2	450	1.6	.050
3.	SANTA ANITA CREEK AT SANTA ANITA DAM	10.8	5.8	2.5	690	1.1	.060
4.	SAN DIMAS CREEK AT SAN DIMAS DAM	16.2	8.6	4.8	440	1.5	.050
5.	EATON WASH AT EATON WASH DAM	9.5	7.3	4.4	600	1.3	.060
6.	SAN ANTONIO CREEK NEAR CLAREMONT	16.9	5.9	3.0	1,017	1.2	.055
7.	SANTA CLARA RIVER NEAR SAUGUS	355.0	36.0	15.8	140	5.6	.050
8.	TEMECULA CREEK AT PAUBA CANYON	168.0	26.0	11.3	150	3.7	.050
9.	SANTA MARGARITA RIVER NEAR FALLBROOK	645.0	46.0	22.0	105	7.3	.055
10.	SANTA MARGARITA RIVER AT YSIDORA	740.0	61.2	34.3	85	9.5	.055
11.	LIVE OAK CREEK AT LIVE OAK DAM	2.3	2.9	1.5	700	.8	.070
12.	TUJUNGA CREEK AT BIG TUJUNGA DAM	81.4	15.1	7.3	290	2.5	.050
13.	EAST FULLERTON CREEK AT FULLERTON DAM	3.1	3.2	1.7	140	.6	.035
14.	LOS ANGELES RIVER AT SEPULVEDA DAM	152.0	19.0	9.0	145	3.5	.050
15.	PACOIMA WASH AT PACOIMA DAM	27.8	15.0	8.0	315	2.4	.050
16.	ALHAMBRA WASH ABOVE SHORT STREET	14.0	9.5	4.6	85	.6	.015
17.	BROADWAY DRAIN ABOVE RAYMOND DIKE	2.5	3.4	1.7	100	.28	.015
18.	BALLONA CREEK AT SAWTELLE BLVD.	88.6	11.8	5.6	64	1.2	.020
19.	SAN JOSE CREEK AT WORKMAN MILL ROAD BRIDGE	81.3	23.7	9.1	75	2.4	.030

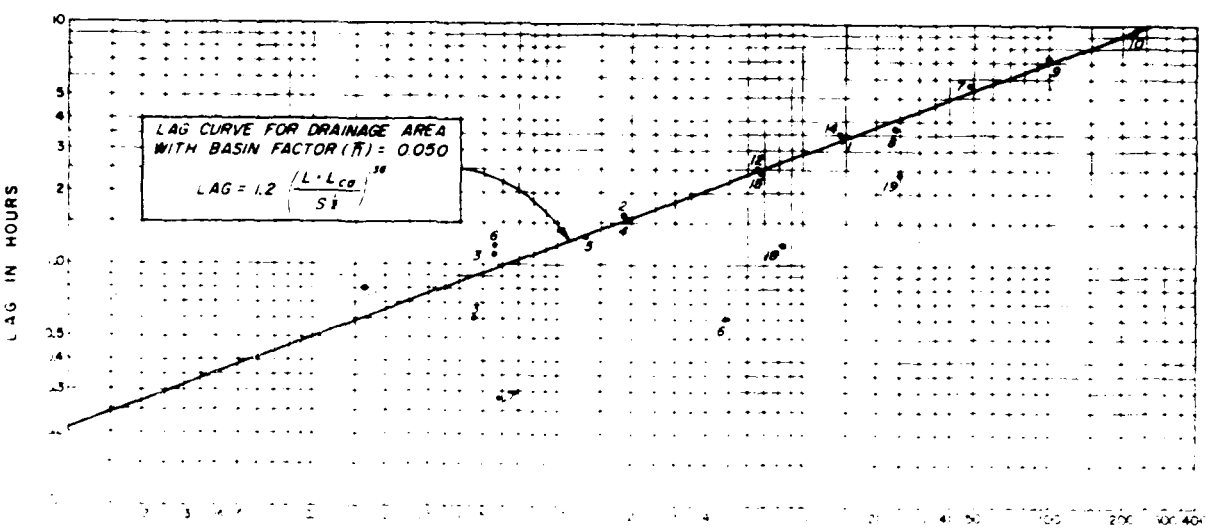
GUIDE FOR ESTIMATING BASIN FACTOR (R)

R=0.200 DRAINAGE AREA HAS COMPARATIVELY UNIFORM SLOPES AND SURFACE CHARACTERISTICS SUCH THAT CHANNELIZATION DOES NOT OCCUR. GROUND COVER CONSISTS OF CULTIVATED CROPS OR SUBSTANTIAL GROWTHS OF GRASS AND FAIRLY DENSE SMALL SHRUBS, CACTI, OR SIMILAR VEGETATION. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

R=0.050 DRAINAGE AREA IS QUITE RUGGED, WITH SHARP RIDGES AND NARROW, STEEP CANYONS THROUGH WHICH WATERCOURSES MEANDER AROUND SHARP BENDS, OVER LARGE BOULDERS, AND CONSIDERABLE DEBRIS OBSTRUCTION. THE GROUND COVER, EXCLUDING SMALL AREAS OF ROCK OUTCROPS, INCLUDES MANY TREES AND CONSIDERABLE UNDERBRUSH. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

R=0.030 DRAINAGE AREA IS GENERALLY ROLLING, WITH ROUNDED RIDGES AND MODERATE SIDE SLOPES. WATERCOURSES MEANDER IN FAIRLY STRAIGHT, UNIMPROVED CHANNELS WITH SOME BOULDERS AND LODGED DEBRIS. GROUND COVER INCLUDES SCATTERED BRUSH AND GRASSES. NO DRAINAGE IMPROVEMENTS EXIST IN THE AREA.

R=0.015: DRAINAGE AREA HAS FAIRLY UNIFORM, GENTLE SLOPES WITH MOST WATERCOURSES EITHER IMPROVED OR ALONG PAVED STREETS. GROUND COVER CONSISTS OF SOME GRASSES WITH APPRECIABLE AREAS DEVELOPED TO THE EXTENT THAT A LARGE PERCENTAGE OF THE AREA IS IMPERVIOUS.



TERMINOLOGY

L = LENGTH OF LONGEST WATERCOURSE

L_{ca} = LENGTH ALONG LONGEST WATERCOURSE, MEASURED UPSTREAM TO POINT OPPOSITE CENTER OF AREA

S = OVER-ALL SLOPE OF LONGEST WATERCOURSE BETWEEN HEADWATER AND COLLECTION POINT

LAG = ELAPSED TIME FROM BEGINNING OF UNIT PRECIPITATION TO INSTANT THAT SUMMATION HYDROGRAPH REACHES 50% OF ULTIMATE DISCHARGE

$\bar{R}$ = VISUALLY ESTIMATED MEAN OF THE R (MANNING'S FORMULA) VALUES OF ALL THE CHANNELS WITHIN AN AREA

NOTE

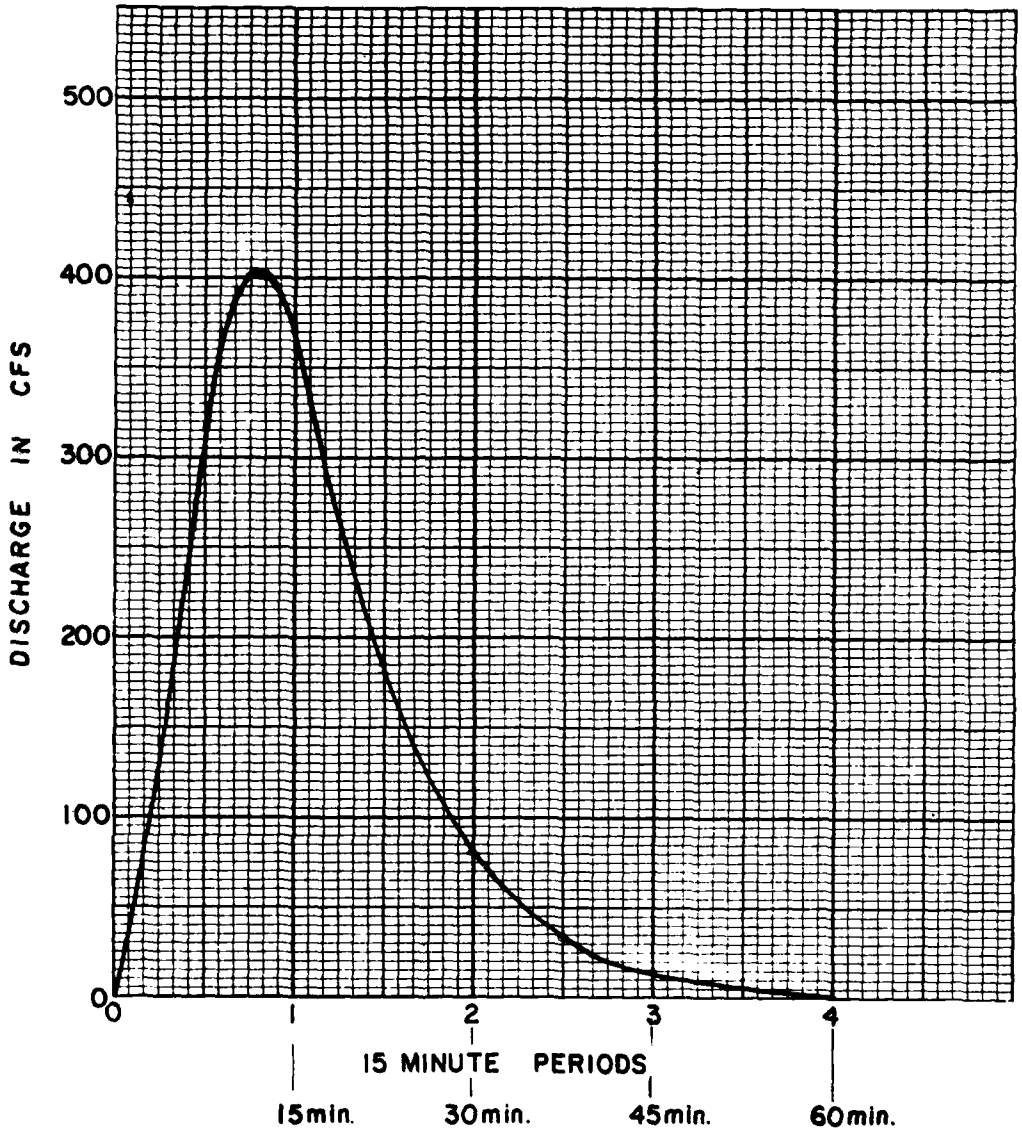
TO OBTAIN THE LAG (IN HOURS) FOR ANY AREA, MULTIPLY THE LAG OBTAINED FROM THE CURVE BY

$\frac{\bar{R}}{0.050}$ OR 20$\bar{R}$

TOLUCA PARK CANYON
SAN DIEGO COUNTY, CALIFORNIA

LAG RELATIONSHIPS

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS



DA = 1.57 sq. mi.
UNIT DURATION = 15 minutes
TIME TO PEAK = 12 minutes
U.G. PEAK DISCHARGE = 400 cfs

TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

15 MIN. UNIT HYDROGRAPH
(SUBAREA A)

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 16

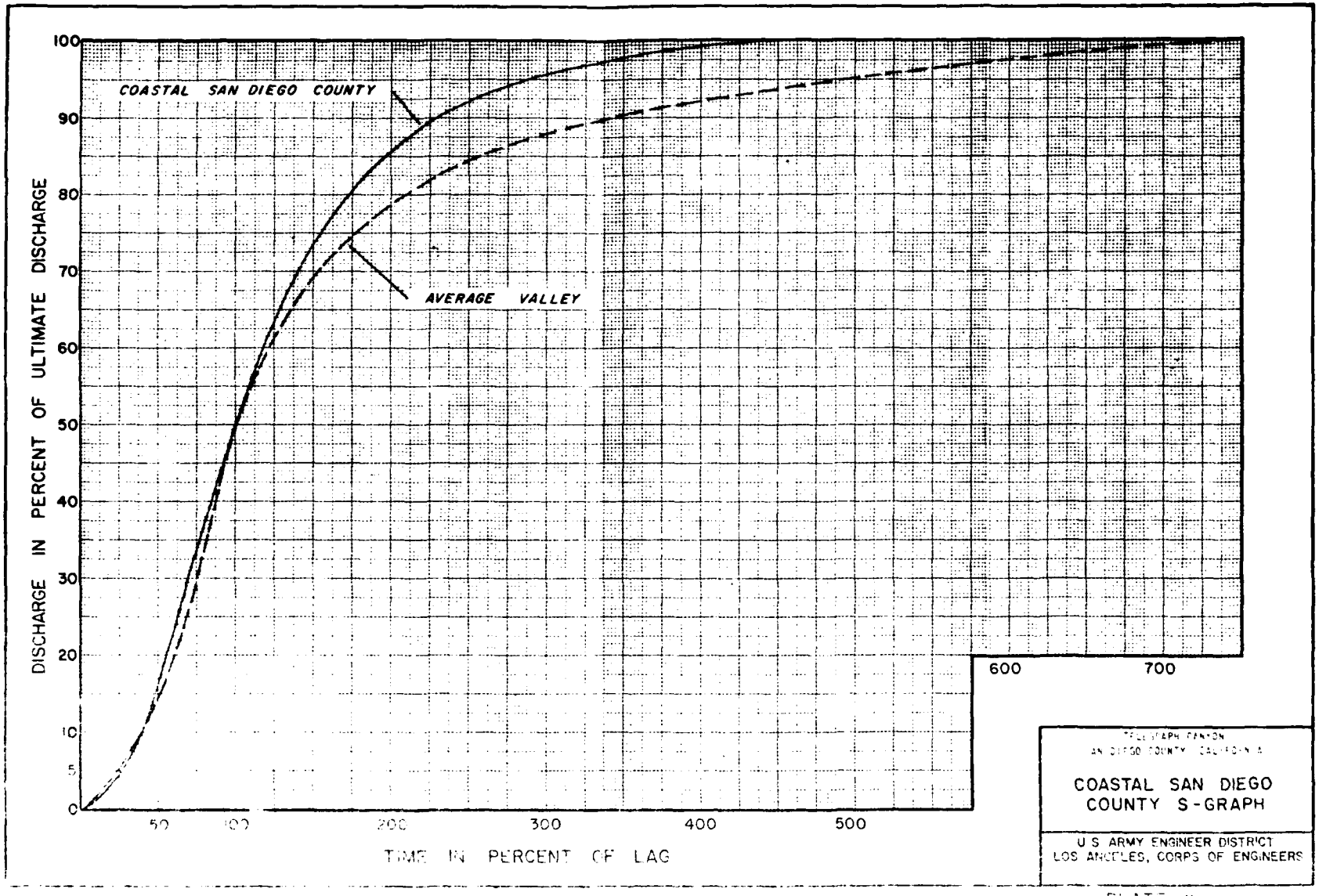
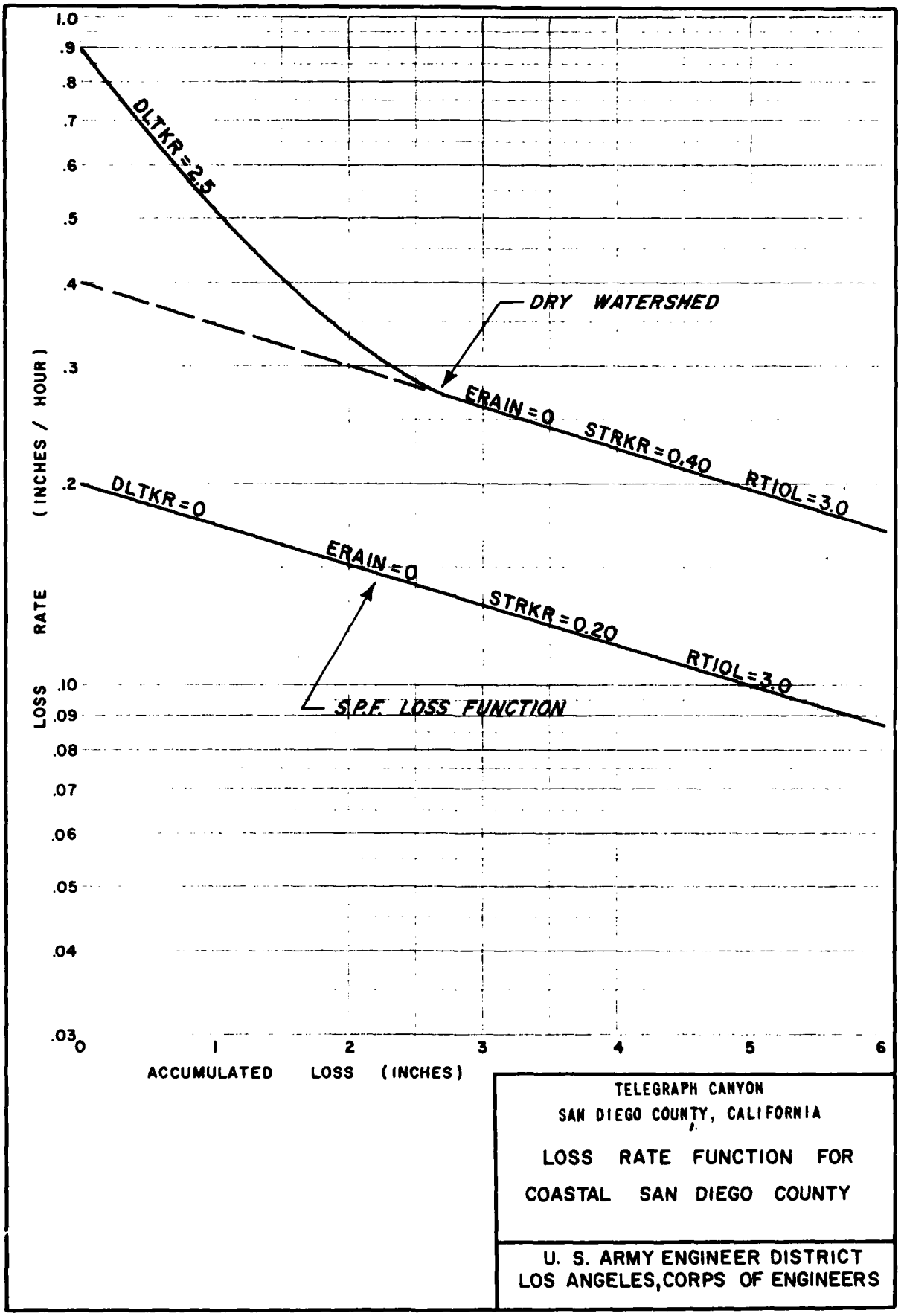

COASTAL SAN DIEGO COUNTY
AVERAGE VALLEY
DISCHARGE IN PERCENT OF ULTIMATE DISCHARGE
100
90
80
70
60
50
40
30
20
10
5
0
50
100
200
300
400
500
600
700
TIME IN PERCENT OF LAG
TELEGRAPH CANYON
SAN DIEGO COUNTY CALIFORNIA
COASTAL SAN DIEGO COUNTY S-GRAPH
U S ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 17



TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

LOSS RATE FUNCTION FOR
COASTAL SAN DIEGO COUNTY

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 18

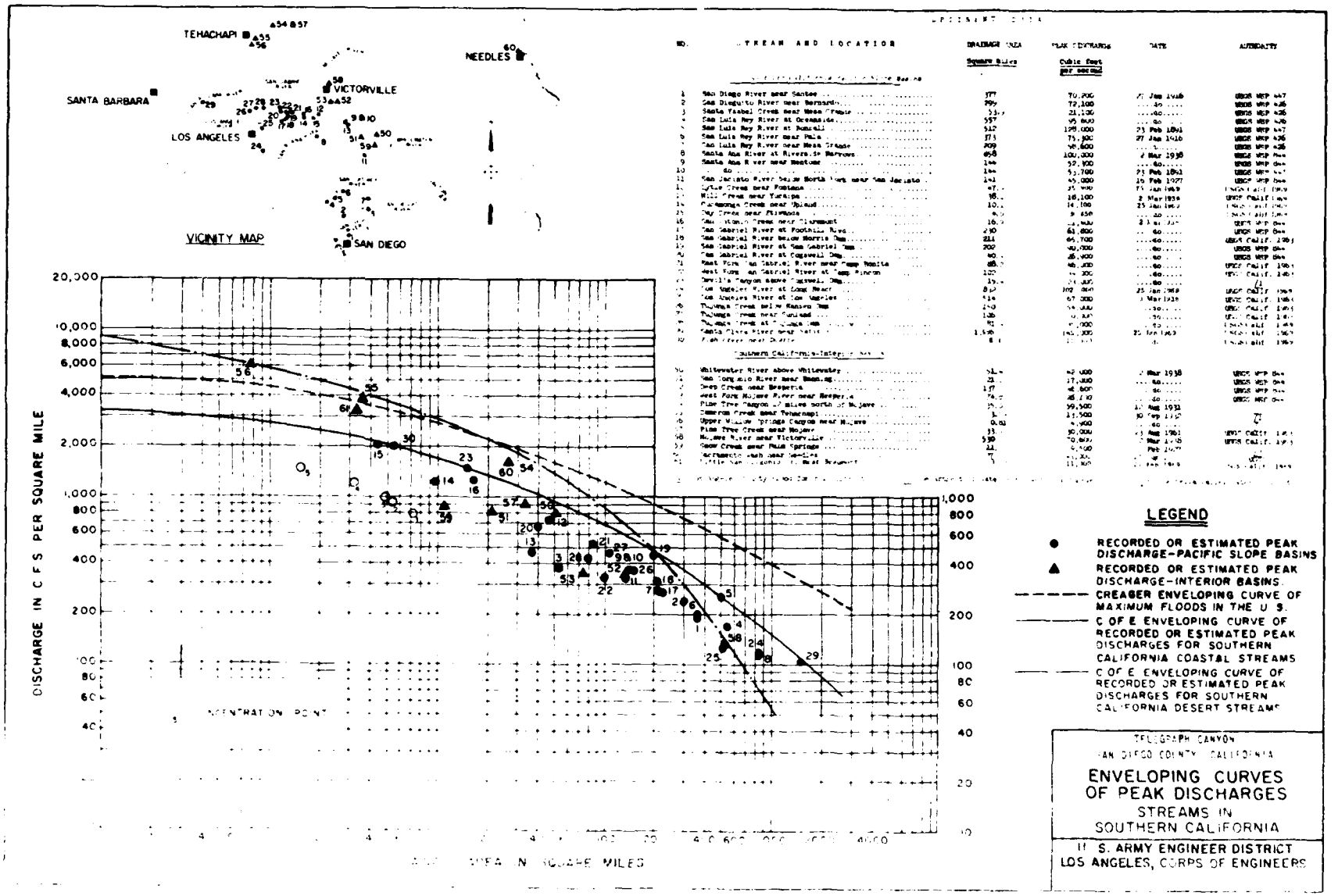
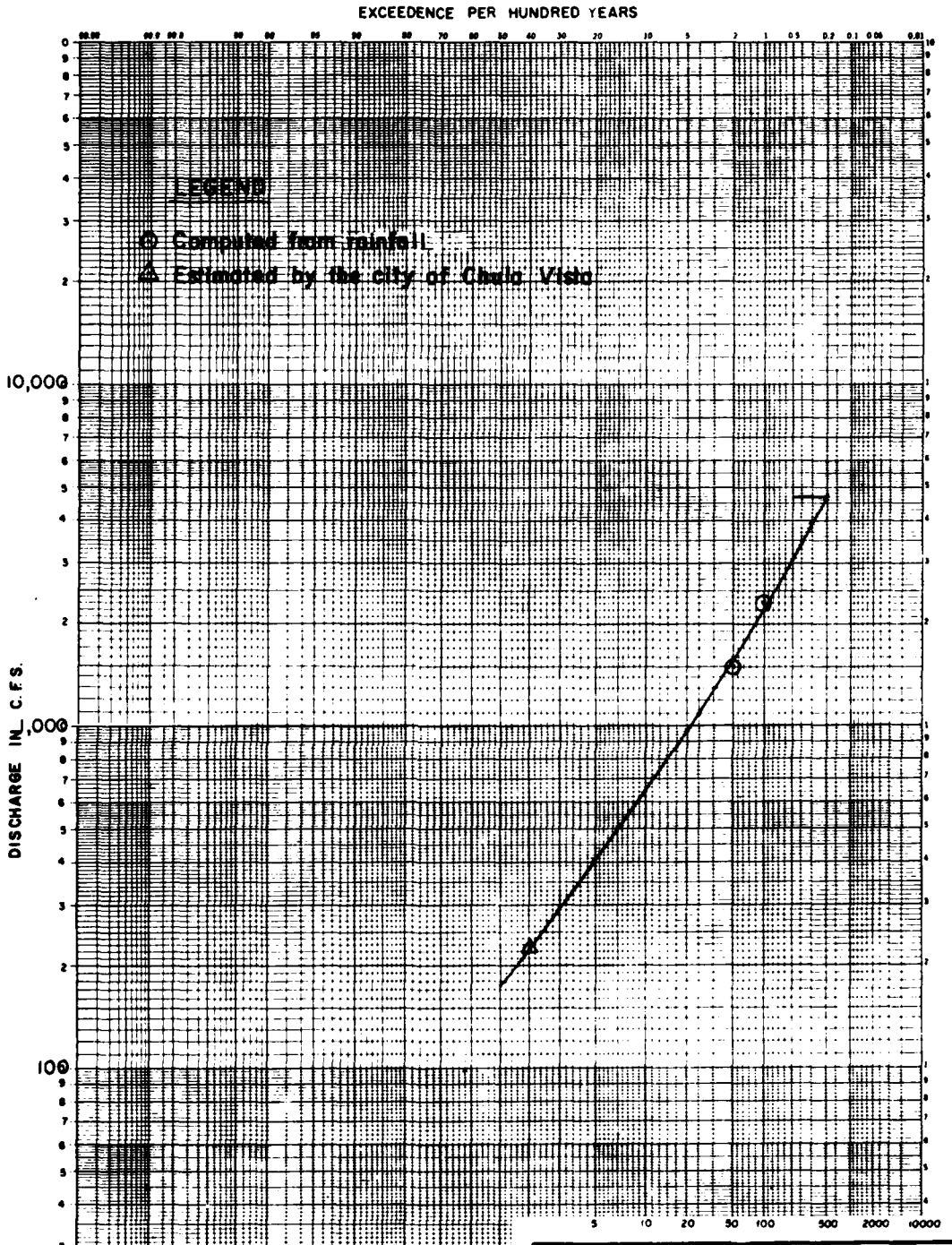

TEHACHAPI
NEEDLES
SANTA BARBARA
VICTORVILLE
LOS ANGELES
SAN DIEGO
VICINITY MAP
DISCHARGE IN C F S PER SQUARE MILE
AREA IN SQUARE MILES
LEGEND
RECORDED OR ESTIMATED PEAK DISCHARGE-PACIFIC SLOPE BASINS
RECORDED OR ESTIMATED PEAK DISCHARGE-INTERIOR BASINS
CREAGER ENVELOPING CURVE OF MAXIMUM FLOODS IN THE U S.
C OF E ENVELOPING CURVE OF RECORDED OR ESTIMATED PEAK DISCHARGES FOR SOUTHERN CALIFORNIA COASTAL STREAMS
C OF E ENVELOPING CURVE OF RECORDED OR ESTIMATED PEAK DISCHARGES FOR SOUTHERN CALIFORNIA DESERT STREAMS
TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA
ENVELOPING CURVES OF PEAK DISCHARGES
STREAMS IN SOUTHERN CALIFORNIA
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 19



TELEGRAPH CANYON
SAN DIEGO COUNTY, CALIFORNIA

DISCHARGE-FREQUENCY CURVE

PRESENT CONDITIONS
AT HILLTOP DRIVE

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

PLATE 20

APPENDIX F

DESIGN AND COST

APPENDIX F
DESIGN AND COST

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GEOLOGY AND SOILS

1. Topography. Telegraph Canyon is located within the physiographic boundaries of the Peninsular range province, which occupies all of southwestern California south to the tip of Baja California, Mexico. This province, developed on an extensive uplifted fault block, is expressed topographically by mountain ranges separated by intermediate valleys, steep sloped hills and low lying coastal plains. Elevations of 6,500 feet are found on the higher peaks, approximately 50 miles east of the coast. The proposed Telegraph Canyon Creek channel is located on the Pacific side of the Peninsular range in the coastal plain sub-province. This sub-province consists primarily of mesa-like terraces that range from near sea level to about 1,200 feet elevation. These terraces grade inland into rolling hills topped by remnants of terraces. Intermittent rivers and streams have dissected these marine terraces and formed deep flat-bottomed valleys in their western and southwestern flow to the ocean. Later erosional and depositional cycles have filled many of these valleys with as much as 200 feet of alluvium.

2. Regional geology. Telegraph Canyon Creek rises in the gently dipping southwest lower slopes of the San Miguel Mountains, approximately 9 miles northeast of the project site and crosses sedimentary rock of Tertiary age for the first 6-1/2 miles of its course. Downstream from this area the stream leaves the highlands and flows across a wide aggraded valley to the San Diego Bay. The valley walls are cut from dissected Pleistocene marine, lagoonal and non-marine sedimentary deposits. The valley floor consists of Recent and Pleistocene age flood plain materials, primarily sands, silts and sandy or silty clays.

3. Site geology. The complete length of the channel excavation will be in alluvial soils of Recent age. These materials consist of poorly consolidated micaceous sands, silts and silty clays derived from erosion of the nearby highlands. The maximum depth of these deposits is estimated to be in excess of 200 feet.

4. Groundwater. Information concerning groundwater in the lower Telegraph Canyon Creek drainage area is limited. There has been no well monitoring program since 1971. Seventeen locations were explored with test holes and test pits from 1977 to 1979. Groundwater was encountered at seven locations. The data is presented below:

Hole No/Pit No.	Stationing	Approximate Elv. (MSL)	Depth to Water (feet)
TP 78-4	21+00	+10	6-1/2
TP 78-3	29+00	+14	8
TP 79-1	36+00	+15	11
TP 78-2	36+00	+15	9
TH CTB-68-6	40+00	+23	12
TH CTB-68-5	41+00	+22	12
TH 79-3	52+20	+31	25

5. Groundwater Quality. Analysis of water from two wells at the San Diego County Club, located 1 mile south of Telegraph Canyon and approximately 1/2 mile upstream from the project area, indicate that a saline condition exists along this portion of Telegraph Canyon. These wells are located on the country club property and are being used to irrigate the golf course fairways. The quality of water from these wells is marginal and contain a fairly high concentration of sodium chloride and sulfate. The results of water analysis from samples taken in August 1972 and July 1973 are shown below:

	WELL WATER	
	PPM 1972	PPM 1973
Sodium	400	370
Calcium	172	170
Magnesium	65	91
Potassium	4	4
Chloride	660	364
Sulfate	433	474
Bicarbonate	263	270
Nitrate	18	23

6. There are no domestic water wells in the project area, as all domestic water is imported from the Colorado River and other sources. Water quality studies in 1977 by the US Army Engineer District, Los Angeles, show that saline ground water is also present in the lower Sweetwater River, approximately 2 miles to the north. This same condition has been noted along the Otay River, 2-3 miles to the south.

7. The maximum high tide is at elevation +3 MSL. The seawater can extend about 600 feet upstream in the natural channel and can be assumed to infiltrate into the shallow groundwater up to that point. With the recommended plan, the channel would be concrete lined upstream from a point about 550 feet from the shoreline. Construction of the project will have no effect upon seawater intrusion.

8. Faults. There are a number of significant faults in the Telegraph Canyon project area as described below:

a. The southwest-trending Rose Canyon fault, traceable as a fault zone from offshore at La Jolla to a point about 8 miles north of the downstream end of the project, and thought to extend through the San Diego Bay to the Mexican border.

b. Three unnamed north-trending faults traversing the city of Coronado and the Silver Strand, located 3 to 7 miles west of the downstream end of the project.

c. A prominent, unnamed, offshore, north-northwest trending fault located south of Point Loma, about 10 miles west of the downstream end of the project.

d. The Sweetwater fault, located about 1 mile east of the upstream end of the project.

e. The La Nacion fault, located about 3 miles east of the upstream end of the project.

9. Other major faults in the region capable of producing destructive earthquake include the Vallecitos, Elsinore, Aqua Caliente, San Jacinto, San Andreas and San Clemente faults, located 30, 40, 51, 60, 100, and 40 miles from the project, respectively.

10. Seismicity. Since 1800, approximately six earthquakes having magnitudes greater than 5.0 Richter have occurred within 40 miles of the site. Most of these earthquakes appear to be related to activity on the Elsinore, Agua Caliente, and offshore faults. The most severe shaking reported for the San Diego area occurred on May 27, 1862. This earthquake was possibly centered a few miles off Point Loma or along an offshore strand of the Rose Canyon fault zone. The magnitude of the event was probably 5.7 to 6.0 Richter magnitude. The location and magnitude estimates are based on historical statements of residents regarding:

a. The duration of strong shaking.
b. The southerly direction of approach of the earthquake tremors.
c. The low rumbling noise immediately preceeding those tremors.
d. The occurrence of landslides on Point Loma.
e. Ground cracking and ejection of streams of waters.
f. The extent of structural damage to buildings.

11. During the 10-year period, 1954 to 1964, five earthquakes with Richter magnitudes 3.5 to 3.9 were centered on or adjacent to San Diego Bay, within 15 miles of the project.

12. Approximately 40 other earthquakes of Richter magnitude 4.0 or greater have occurred within a 35 mile radius of the site during the last 40 years. These earthquakes have occurred close to the project area, but are not known to have caused structural damage. Plate F-2 shows all major faults and all seismic events of a Richter magnitude 4.0 or greater within 100 mile radius of the project area and seismic events less than magnitude 4.0 within a 25 mile radius. Table F-1 lists eight of these faults, their approximate distance from the project area and the maximum credible earthquakes that could occur along these faults.

TABLE F-1

TABULATION OF LARGE FAULT SYSTEMS, MAXIMUM CREDIBLE
RICHTER MAGNITUDE AND ASSOCIATED SITE BEDROCK ACCELERATIONS

Fault	Distance from Site	Maximum Credible Earthquake Magnitude	Length of Fault	Bedrock Accelerations
Rose Canyon	1-3 miles	6.7	30 mi+	.62g
La Nacion	2-4 miles	6.5	15-20 mi	.52g
Unnamed fault S-SW of Point Loma	9-10 miles	6.9	40-45 mi	.38g
Vallecitos	30 miles	6.9	45 mi	.16g
San Clemente	40 miles	7.2	90 mi	.12g
Elsinore	40 miles	7.4	140 mi	.13g
San Jacinto	60 miles	7.4	140 mi	.08g
San Andreas	100 miles	8.5	700 mi	.05g

Magnitudes calculated by $M = 2.008 + 1.075 (\text{Log } L)$.

13. The Rose Canyon fault would be the most probable local source for a damage producing earthquake. The fault lies closest to the project, about 1-3 miles away. The epicenters of several events which occurred during historic times are located near the fault, but only one, the event of May 27, 1862, has exceeded magnitude 4.0. The possibility of recent activity is not ruled out, though no direct field evidence has been found to support this possibility. Unpublished literature by State Division of Mines, geologists and private firms working in the area suggest that the fault is active, but currently dormant.

14. Based on the above data, an earthquake of Richter magnitude 5.8 is selected to represent a local design earthquake event. It is estimated that the recurrence interval for such an event would be about 100 years and that bedrock accelerations at the site would be as high as 0.5g.

15. The most probable source of a major regional earthquake, in the project area, would be the result of movement along the Elsinore fault about 40 miles from the site. The bedrock acceleration at the site, resulting from as large an earthquake as the maximum credible of magnitude 7.4, would be approximately 0.13g.

16. In the event of a major earthquake along any one of the faults mentioned above, it is anticipated that the level of shaking would cause only minor damage to the channel. Such damage might be in the form of minor side slope slumping, or the dislodgement of riprap. There are no known active faults that intersect the channel alinement. Thus there is no potential to disrupt the channel alinement due to fault displacement.

17. Previous field investigations. Prior to the field investigation, a literature search was conducted for geotechnical information on the subject area. Three studies were located.

18. The first report was entitled A Geologic Investigation of Test Trench Excavations at Telegraph Canyon and was prepared for the Corps of Engineers by WESTEC Services. The report studied the reach between stations 20+00 and 40+00, and was prepared primarily as an archeological study. The pits excavated were logged and disturbed samples were gathered for laboratory testing. The pits were numbered TP 78-1, 2, 3, and 4.

19. The second study was conducted by Caltrans for the design of Interstate 5, adjacent to Telegraph Creek. The holes at this study were numbered CTB68-5 and CTB68-6.

20. The third report was prepared by William S. Krookos and Associates, foundation engineers, for a real estate developer. The holes were located at the upper extreme of the project and are designated as TB77-1, 2, 3, 4, and 5.

21. The information from each of the three studies was used to supplement the recent explorations. The locations of the above test

holes and test pits are shown on plate F-2; the logs are shown on plate F-3.

22. Recent field investigation. Field explorations for the proposed levee and channel system consisted of drilling 6 test holes, TH 79-1, 3, 5, 6, 7 and 10, along the alinement to a maximum depth of 30 feet. The holes were drilled with an 18-inch bucket-type power auger during January 1979. Rain had inundated the area just prior to the investigation. The locations and logs of the test holes are shown on plate F-2. The materials encountered were visually classified and disturbed representative samples of materials were obtained for detailed laboratory testing. Standard penetration tests were conducted in each test hole. The results of the penetration test are presented in figure F-1.

23. Laboratory tests. Mechanical analysis, Atterberg limits, moisture content determination, compaction, and consolidated undrained triaxial shear tests with pore water pressure measurements ($\bar{R}$-type), have been conducted on representative disturbed samples in accordance with EM-1110-2-1906. The soil classification is in accordance with the Unified Soil Classification System (USCS). The results of the laboratory tests are presented in figures F-2 through F-7. Logs of borings by others have been reclassified to USCS standards and are presented on plate F-3.

24. Foundation conditions. An evaluation of the data collected by the investigations and laboratory tests indicates that, generally, the foundation conditions within the limits of the project may be represented by the two reaches discussed below:

a. Stations 20+00 to 40+00. The surficial foundation materials (top 5 feet) are non-plastic, stiff sandy silts with about 75 percent fines with moisture contents ranging from about 5 to 20 percent. Below 5 feet, the foundation materials encountered are predominately sandy clays and clayey sands, having from 30 to 60 percent fines. These materials are generally medium dense to stiff with occasional soft lenses. The plasticity index ranges from 8 to 35, and the liquid limit ranges from 25 to 56 although generally being from 25 to 40. The moisture contents ranged from 5 to 30 percent. Groundwater was encountered at about 6 to 10 feet below ground surface. The moisture contents greater than 20 percent above groundwater are believed to be due, in part, to the rains prior to the investigation.

b. Station 40+00 to 106+00. Generally, the foundation materials encountered within this reach are sandy clays and clayey sands, with 30 to 60 percent fines, and occasional lenses of sandy gravel with as few as 10 percent fines. The materials are stiff or dense, and have moisture contents ranging from 5 to a high of 35 percent. The higher moisture contents appear to be due to the influence of rain. The plasticity index ranges from 4 to 32 and the liquid limit ranges from 22 to 47 for the plastic materials. Groundwater was encountered only at station 52+25 (TH79-3) at a depth of approximately 22 feet.

25. Design values. Representative design values were selected based on field and laboratory tests for the remolded and representative in-situ materials. Density values, to represent the compacted fill material, were based upon the results of compaction tests. The moist unit weight was assumed to be at 95 percent of maximum density (ASTM 698) and optimum moisture content. Dry and saturated unit weights for the fill materials were also determined at 95 percent of maximum density. The density values of the in-situ materials were determined from the moisture content of the materials below the ground water level and their known specific gravity of 2.69.

26. The strength parameters of the compacted fill were based on the results of the "R" triaxial shear tests. Both the effective and total values of the internal angle of friction are presented along with the corresponding cohesion values. The shear strength of the in-situ materials was based upon the known strength of the remolded materials adjusted downward to reflect the lower densities of the in-situ materials (The in-situ values generated for this study are in agreement with actual in-situ values for similar materials on an adjacent Corps of Engineer's project along the Sweetwater River. At Sweetwater, the "R-type" angle of internal friction used was 16 degrees and the "S-type" angle of internal friction was 31 or 32 degrees.)

27. Selected design values for the proposed improvements are shown below.

Selected Design Values

Station 20+00 to 40+00	Compacted Fill	In-situ Material
Dry weight, (pcf)	105	92
Moist weight, (pcf)	122	113
Saturated weight, (pcf)	128	121
Angle of internal friction		
S-type, (degrees)	33	30
R-type, (degrees)	15	14
Cohesion		
S-type, (psf)	0	0
R-type, (pfs)	400	400
Permeability, (fpd)	0.1	0.1
Equivalent fluid weight		
active, (pcf)	45	
at-rest, (pcf)	70	

Station 40+00 to 106+00 Material	Compacted Fill	In-situ
Dry weight, (pcf)	112	106
Moist weight, (pcf)	127	122
Saturated weight, (pcf)	132	129
Angle of internal friction		
S-type, (degrees)	30	28
R-type, (degrees)	17	15
Cohesion		
S-type, (pcf)	0	0
R-type, (pcf)	400	400
Permability, fpd	0.1	0.1
Equivalent fluid weight		
active, (pcf)	45	
at-rest, (pcf)	70	

28. Slope stability. The stability of the proposed channel slope was analyzed using criteria set forth in EM 1110-2-1902. The riverside channel slope was analyzed for post construction, partial pool, and rapid drawdown conditions using the circular arc method of analysis. Since the channel is entrenched, no analysis was necessary for the landside slope. The seepage phreatic surface for the analysis was conservatively assumed to extend horizontally into the levee from the contained water surface.

29. The slope stability of the proposed channel was also analyzed for earthquake loading using a psuedo-static force. The seismic coefficient used in the stability analysis was 0.15 based upon Algermissen's seismic zoning map. Slope displacements are possible during a local design earthquake; however, a failure wouldn't be of a critical nature because the probability of such an earthquake occurring during periods of high water level is remote and because of the entrenched nature of the channel.

30. The results of the stability analyses are presented below and in figures
F-8, 9, and 10. Slopes of 1V on 2H were selected for the levee. In all cases the safety factors exceed the minimum requirements established by EM 1110-2-1902.

STABILITY FACTORS OF SAFETY

	with earthquake	without earthquake
Post Construction	1.5	2.4
(minimum required)	1.0	1.3

Partial Pool	1.2	1.9
(minimum required)	1.0	1.5
Rapid Drawdown	--	1.7
(minimum required)	--	1.0

Design applications.

31. Compacted levee fill and backfill. All embankments and backfill for structures shall be constructed of select material from the required project excavation. Select material will be available within both main reaches of the project and shall consist of clayey sands, sandy clays, or sandy silts. The percentage of fines shall range between 30 and 60 percent. Excess select material from the upper reach (above station 40+00) may be stockpiled for use as levee fill or backfill, as necessary. The material shall be placed in 1 foot lifts at not less than 95 percent of maximum density (ASTM 698) and within 2 percent of optimum moisture. Materials not containing a moisture content of within 2 percent of optimum would be wetted or dried back, as required. Processing materials with a moisture content greater than 5 percent above the optimum range (particularly those materials obtained from below the groundwater level) will be impractical and those materials would be wasted.

32. Channel excavation. The proposed channel would be constructed by open cut. Permanent excavation slopes shall not be steeper than 1V on 2H. Temporary excavation slopes that do not encounter groundwater shall not be steeper than 4V on 3H. No temporary slopes below groundwater shall be steeper than 1V on 1H.

33. Foundation piling. The proposed bridge across the lower reach of the channel (station 33+80) would be founded on treated timber piles driven below groundwater level. The pile capacity was determined in accordance with TM 5-818-1. The adhesion strength used, 750 psf, was based upon the soil consistency as determined by blow count. Figure F-11 shows individual pile capacity vs. depth for several pile diameters. A safety factor of 3 was used in determining the allowable capacity of the piles. Settlement was limited to 1 inch. In grouping piles, a spacing of not less than 4 times the butt diameter or 3 1/2 feet (whichever is greater) must be maintained between the pile centers. Group pile capacity would be the sum of the individual pile capacities.

34. Riprap. Riprap would be required at the upstream and downstream ends of the concrete lined channel. Eighteen inches of riprap on a 9-inch filter blanket would be placed immediately upstream of the grouted stone inlet. The blanket would extend across the inlet and would be 10 feet in length. At the downstream end, 24 inches of riprap on a 9-inch filter blanket would be required across the invert and on the sideslopes immediately downstream from the drop structure between station 24+63 and

24+00. Additionally, the sideslopes between stations 24+00 and 20+83.43 (downstream end of channel) would be lined with 12 inches of riprap on a 6-inch filter blanket.

35. The specific gravity of the riprap material would not be less than 2.60. Gradation requirements for the channel riprap and filter blanket linings are given below. A filter gradation was selected considering both permeability and non-migration criteria. The coarse limit of the D_{15} of the filter is less than 5 times the D_{85} of the embankment material, the fine limit of the D_{85} of the filter is greater than one-fifth the D_{15} of the riprap, and the coarse limit of the D_{15} of the filter is less than one-fifth the D_{15} of the riprap.

RIPRAP GRADATION

Stone weight-lbs.	Percent passing by weight
12-inch section	
85	100
35	65 - 100
25	50 - 70
15	15 - 50
5	0 - 15
18-inch section	
290	100
115	65 - 100
85	50 - 70
50	15 - 50
20	0 - 15
24-inch section	
700	100
275	65 - 100
200	50 - 70
120	15 - 50
45	0 - 15

FILTER BLANKET GRADATION

Sieve Size	Percent passing by weight
1-1/2 inch	100
3/4 inch	65 - 100
3/8 inch	50 - 70
No. 10	15 - 35
No. 16	0 - 15

36. Grouted stone. Grouted stone would be used to line the sideslopes of the approach channel wing walls at the upstream channel inlet between stations 105+51.83 and 104+61.83 and 10-foot length of the invert

upstream from station 104+81.83. Grouted stone would also be used to line the channel outlet below station 20+81.43. The grouted section would be 15 inches thick, and the stone would be open graded ranging in size from 4 to 12 inches. There would be no bedding material beneath the grouted stone.

37. Dewatering. It is not anticipated that dewatering would be required to excavate or construct the proposed improvements above station 40+00. Between stations 40+00 and 24+00, some dewatering may be required to construct the proposed channel and drop structure. This reach could be constructed prior to excavating the lower reach of the channel in order to eliminate tidal inundation. Dewatering of the reach could be initiated by over excavating the channel invert subgrade level between stations 39+67 and 24+63 by 9 inches. The center of the channel invert subgrade may then be excavated to form a drainage ditch, about 3 feet deep and 3 feet wide, from station 39+67 to drain into the elevated drop structure area near station 25+20. The ditch invert should be sloped similar to the proposed invert. The over-excavated invert may then be backfilled with a drainage blanket material, either pit run or graded, as per plate F-14. The drainage ditch would not be filled with drainage material at this point. The drainage blanket could act as both a working mat and, in post construction, as an element of the subdrain system. No equipment, other than light tractors or backhoes, should be allowed to work on top of the drainage blanket. The drainage ditch would collect and lower the groundwater below the invert level. A temporary pump capacity of 50 gpm would be required at the downstream end to drain the ditch for the construction phase. Gradations for pit-run and graded drain blanket materials follow the subparagraph: Sub-drainage system.

38. Sub-drainage system. A sub-drainage system above station 40+00 is not necessary. Historically, groundwater within this reach has not risen above the invert of the proposed structure. Saturation to the structural backfill, as a result of surface inundation, is unlikely due to the impervious nature of the material and positive surface drainage control. Cracking of the backfill, which would allow a hydrostatic pressure buildup, is to be controlled by placing the backfill at within 2 percent of optimum moisture.

39. Below station 40+00, a sub-drainage system will be required between stations 39+67 and 24+63. The preliminary excavation and preparation of this system is discussed in the sub-paragraph: Dewatering. Immediately prior to construction, the dewatering drainage ditch between stations 39+67 and 25+35 would be backfilled with drain blanket materials in such a manner that the drainage wedge, as shown on plate F-14, may be constructed. A 6-inch perforated pipe and drain material will then be installed as per plate 13. Cleanout intercepts shall be constructed at station 39+60, 36+50, 33+50, 30+50, and 27+50. The intercepts shall be covered with removable plates that will allow for periodic maintenance. The top of the plates will be level with the channel invert.

40. Gradations for the pit-run and graded drainage blanket and drain materials are given below. The gradations were selected considering both permeability and non-migration criteria.

DRAIN BLANKET, PIT-RUN

This material would be sand and gravel or sand having not more than 10 percent passing the number 200 sieve. Material meeting these requirement may be obtained from the required excavation and/or from commercial sources.

DRAIN BLANKET, GRADED

Sieve size	Percent passing by weight
No. 3/8	100%
No. 4	95 - 100
No. 16	45 - 75
No. 100	0 - 10

DRAIN MATERIAL

Sieve size	Percent passing by weight
1-1/2 inch	100
3/4 inch	65 - 95
3/8 inch	20 - 55
No. 40	0 - 5

41. The drainage pipe would have perforation diameters of not less than 1/4 inch nor greater than 3/8 inch. The perforated area should not be less than 0.25 square inches per linear foot of drainage pipe.

42. Sources of construction material. Construction materials will be available from the required excavation and from commercial sources. Materials for the levee fill and structural backfill would be obtained from the channel excava-tion. The filter blanket, riprap stone, and grouted stone could be obtained from local commercial sources. Sources of stone are presented on table F-2.

TABLE F-2
SOURCES OF STONE

Quarry	Specific Gravity Rock Type	Bulk	Density Apparent	Rattler Absorption lbs/cf	"E" %	Loss	Date Tested	Remarks
Otay Mesa and (Nelson & Sloan)[1]	meta-volcanic	2.69 2.76	2.79 2.78	169.7 173.5	0.6 0.4	15.4 15.4	Aug 78 Aug 78	Used on Tijuana River levees - 1978
Canyon Rock Co. (Mission Gorge)[2]	meta volcanic	2.78 --	2.79 2.74	174.0 171.0	0.1 1.04	12.8 15.0	Mar 73 Feb 76	Used at 5th Avenue fill - San Diego Harbor - 1976.
Twin Oaks (Silberberger)[3]	Granite	2.65 2.67 2.67	2.67 2.68 2.66	166.6 167.2 166.0	0.3 0.3 0.3	-- -- --	Jul 68 Aug 68 Aug 68	Used at Dana Point Breakwater, 1968.

1. Otay Mesa Quarry is located approximately 5 1/2 miles southeast of the project area.

2. Canyon Rock Company Quarry is located approximately 14 miles north of the project area.

3. Twin Oaks Quarry is located approximately 60 miles north of the project area near Oceanside.

Note: The acceptable limits for the proposed stone are as follows: specific gravity bulk, 2.60; specific gravity apparent, 2.60; absorption, 2.0 percent; rattler, 45 percent; or a satisfactory service record. All of the sources listed above are capable of producing suitable stone. An acceptance service record has also been demonstrated by stone produced from those sources.

HYDRAULIC DESIGN

43. General. The hydraulic design of the proposed Telegraph Canyon channel improvement is based on theoretical analyses using the criteria set forth in EM 1110-2-1601 and the Hydraulic Design Charts published by the Waterways Experiment Station. The proposed channel improvements would convey the future 100-year flood having a peak discharge of 3,300 c.f.s., from an inlet structure east of Fourth Avenue to San Diego Bay.

44. Proposed channel. The proposed improvements would comprise the following main structures: an inlet structure, a concrete channel rectangular in cross-section (0.68 mile), a pressure conduit (0.28 mile), the existing culvert under Interstate 5 (0.23 mile), a reach of trapezoidal concrete channel (0.25 mile) and an earth bottom channel outlet. Three transitions and a drop structure would join these main structures.

a. Inlet structure. The 51-foot wide rectangular entrance of the inlet structure would be connected to the high banks of the existing natural channel by vertical wing walls and grouted stone slope transitions. The walls would provide 3 feet of freeboard above the ponded water surface of the future 100-year flood. The channel inlet would transition from the 51-foot base width at stations 104+61.83 to a 20-foot base width at station 101+51.83. Excavation in the inlet area would provide for a small volume of sediment deposition.

b. Rectangular concrete channel. The width of the rectangular concrete channel would be 20 feet from station 101+51.83 downstream to station 92+40. Thence, by means of a 20-foot long transition, the channel would be narrowed to 18 feet downstream to station 68+60. The rectangular channel would intersect 4th Avenue, 5th Avenue and Broadway. The existing bridges (consisting of triple 7' x 12' R.C.B. at 4th Avenue, double 8' x 6' R.C.B. at 5th Avenue, and double 6' x R.C.B. at Broadway) would be removed and replaced.

c. Pressure conduit. The rectangular channel would transition to pressure conduit at station 67+40. The pressure conduit would consist of: a double 13-foot-wide by 10-foot-high box section 670 feet long followed by a double 12-foot-wide by 10-foot-high box section, approximately 800 feet long. The downstream double barrel box would transition to join 4 existing 7-foot-diameter culverts near station 52+17.

d. Existing culverts. The existing culverts, which pass underneath the San Diego and Arizona Eastern Railroad, Industrial Blvd, and Interstate 4 Freeway, consist of four 7-foot-diameter reinforced concrete pipes (125 feet in length) a transition structure from the pipes to a triple box with passages 8 feet-wide by 7 feet-high (989 feet in length) and a transition from the triple box to four 7-foot diameter pipes. The 7-foot diameter pipes would be extended, as necessary to a common headwall at station 39+67.

e. Trapezoidal concrete channel. Downstream from the end of the existing culverts at station 39+67, a transition section would convey the flow to the upstream end of the trapezoidal concrete channel at station 38+50.91. The trapezoidal section, which extends from station 38+50.91 to station 25+35,

would have a 12-foot bottom width, 2.25H on 1V side slopes, and 9 to 11-foot height. To avoid the relocation of existing utilities that cross the existing creek, the proposed channel would follow essentially the alinement and invert elevation of the existing creek. In this reach a utility bridge owned by San Diego Gas & Electric Company would have to be replaced by a longer one to conform with the shape of the proposed channel.

f. Drop structure. A drop structure for dissipating energy would extend from station 25+35 to station 24+00. The section would be trapezoidal in cross section and would consist of reaches of concrete lining, a baffled apron, and 24-inch riprap.

g. Channel outlet. The channel outlet, between station 24+00 and 21+93.61, would consist of a trapezoidal channel with a 40-foot base width and 2-1/4H on 1V revetted sideslopes that would exit into an existing marsh by San Diego Bay. The U.S. Fish and Wildlife Service have agreed that all construction should be terminated at the plus-4-foot contour. To reduce the velocity of flow over the marsh land and thus prevent scour, the channel would be widened from a 40-foot base width to a 230-foot based width between stations 21+93.61 and 19+83.43. The existing channel through the marsh would convey low flows. Larger flows would flow over the grouted sill and cross the marsh to San Diego Bay. The tidal area created by channel excavation would be approximately 2 acres at mean high water.

45. Alinement. The alinement of the rectangular concrete channel and pressure conduit would have eight horizontal curves with deflection angles that range from $18^{\circ}05'01"$ to $77^{\circ}00'14"$ and radii that vary from 108 to 492 feet. Five of the curves would have spiral transition curves 100 feet in length at both ends of the each curve. The remaining curves along the pressure conduit would have simple curves. The alinement of the concrete trapezoidal channel would have four horizontal curves with deflection angles from $01^{\circ}28'51"$ to $21^{\circ}42'01"$ and radii from 150 to 1000 feet.

46. Grades. The invert grades of the rectangular concrete channel and pressure conduit would range from a maximum of 0.041500 to a minimum of 0.003100. The earth-bottom channel would have an invert grade of 0.000500.

47. Water-surface computations. The water-surface computations for open-channel flow were made by the reach method with friction losses calculated by the Manning Formula. An "n" value of 0.012 was used to determine maximum velocities and 0.014 was used to determine wall heights. The Manning "n" values used for the trapezoidal earth channel were 0.027 to determine levee height and 0.022 to determine scour. The "n" values used in the pressure flow calculations were: 0.012 for the double box; 0.013 for the 7-foot-diameter pipes; and 0.0116 for the triple box. Velocities in the super-critical portion of the open concrete channel would range from 12.9 to 31.1 fps. The channel wall heights would range from 7.0 to 11.5 feet. The velocities in the pressure flow conduit would range from 12.79 to 21.44 fps. The pressure head would range from 0 to 11.06 feet. The velocities in the earth-bottom channel would range from 3.0 to 10.0 fps and the depth would range from 6.3 to 8.6 feet.

48. Superelevation. The superelevation of the channel invert would range from a maximum of 1.4 feet to a minimum of 0.64 feet.

49. Freeboard. The freeboard for the concrete channel would be 2.0 feet and the freeboard for the earth channel would be 3.5 feet to allow for sediment deposition in that reach.

50. Bridges. The proposed bridges at 4th Avenue, 5th Avenue, Broadway and the San Diego Gas And Electric Company access road downstream from Interstate 5 would be clear span and would not obstruct flow.

51. Side drainage. Side drainage would enter the channel by sheet flow over the walls except for the existing drains listed below. The existing 60 inch side drain would enter the pressure flow conduit at station 53+20. Flows in the 60-inch drain would enter the conduit until pressure flow condition is established in the conduit at a 1700 cfs discharge. With pressure flow in the conduit, flows from the drain would pond on the area around the conduit and eventually would flow north along the east side of the railroad tracks. Some overflow would occur at the crossings of two unnamed streets, and most of the water would flow through an existing culvert on the railroad tracks. Any remaining flows would pond in the area north of L Street where, historically, ponding has occurred. The peak flow would be about 500 cfs, becoming 200 cfs and 50 cfs about fifteen and thirty minutes later, respectively. Maximum depth and velocity of water would be about 3 ft and 3.5 ft per second respectively, and it is expected to cause little damage to property on the east side of the railroad tracks and none on the west side.

EXISTING SIDE DRAINS

Approximate location	Left side of channel	Right side of channel
Sta 100+37	42"H x 18"V RCB	42"H x 18"V RCB
Sta 100+28		30" CMP
Sta 99+65		20" RCP
Sta 86+30	24" CMP	16" CMP
Sta 72+44		24" RCP
Sta 53+20	60" CMP	
Sta 24+60		12" Steel Pipe
Sta 23+25		24" RCP
Sta 21+00	36" CMP	36" CMP

52. Sediment transport. Telegraph Canyon has a low sediment production. A yield of 0.5 acre feet per square mile per year was selected as representative of the San Diego County streams. There are 4.9 square miles of undeveloped area in the Telegraph Canyon basin. There are approximately 300 cubic yards of sediment storage available in the inlet area. The remaining 3,650 cubic yards would pass through the concrete channel.

53. Model study. The existing culvert under Interstate 5 has low flow training walls in the two transitions from the pipes to the triple box. The

downstream transition is skewed with a shorter transition on the left side as compared to the right side. The resulting losses and changes in flow distribution cannot be determined by analytical means. A model of the approach channel, the pressure conduit and the exit channel was constructed and tested with the design discharge of 3,300 cfs and with discharges of 3,400, 3,500, and 3,600. The higher discharges raised the upstream water surface and moved the hydraulic jump upstream. The hydraulic jump for the design discharge would be located in the high wall section of the entrance structure to the pressure conduit. For flows greater than the design discharge, the hydraulic jump would move upstream of the entrance structure and overtop the channel walls. To prevent spill at the entrance structure for flows larger than the design discharge of 3,300 cfs, the entrance wall will be raised to elevation 55.0, and an additional 2.5-foot high parapet wall will be provided at the headwall of the conduit. The design is based on model studies. Three of the four 7-foot diameter pipes at the downstream end of the freeway culvert would be extended to a common head wall at station 39+67 to evenly distribute the flow approaching the outlet structure. The hydraulic model showed that pressure flow in the conduits would occur only for flows larger than 1,700 cfs.

STRUCTURAL DESIGN

54. General. This section presents the feature design for the structural elements of the proposed flood control plan. The structural elements for this project include a double-barrel concrete culvert, 1.5 miles of rectangular channel walls, and 3 highway bridges.

55. References. The structural elements would be designed in accordance with applicable provisions of the following engineering manuals for civil works construction.

Reference	Title
EM 1110-1-2101	Working Stresses for Structural Design
EM 1110-2-2502	Retaining Walls
EM 1110-2-2902	Conduits, Culverts and Pipes

56. Unit design stresses. Pertinent information on unit design stresses used in the design of the proposed improvements is given in the following table:

UNIT DESIGN STRESSES

Concrete:

Ultimate compressive strength

Cast-in-place structures other than culverts	f'c = 3,000 psi
Culverts	f'c = 4,000 psi

Allowable compressive strength

Flexure for retaining walls	$f_c = 0.35\ f'_c$ = 1,050 psi
Flexure for culverts	$f_c = 0.45\ f'_c$ = 1,800 psi
Bearing	f_c = 750 psi
Ratio	$n = \frac{E_s}{E_c}$ = 9.2 for f'c = 3000 psi n = 8.0 for f'c = 4000 psi
Modulus of elasticity	$E_c = 5700\ f'_c$

Reinforcing steel, Grade 40:

Allowable tensile strength	fs = 20,000 psi
Modulus of elasticity	Es = 29,000,000 psi

Prestressed concrete:

Concrete

Compressive strength of concrete at 28 days	f'c = 5,000 psi
Compressive strength of concrete at transfer	fci = 3,500 psi
Modulus of elasticity of concrete	Ec = 4,300 ksi
Modulus of elasticity of concrete at transfer	Eci = 3,600 ksi

Prestressing steel - 1/2" Ø strand	As = 0.153 in^2
Ultimate strength	f's = 270 ksi
Initial tensile stress	fsi = 0.7 fs' = 190 ksi
Effective stress after losses	fse = 0.8 fsi = 150 ksi

57. The weights and properties of soils are given under the subheading, titled "Geology and Soils."

58. Rectangular channel. The walls of the open rectangular reinforced concrete channel would be designed as L-type or U-type retaining walls. For L-type retaining walls, the invert between the wall footings would be a 10-inch-concrete slab and would have a center mat of steel reinforcement consisting of steel bars 5/8 inch diameter and 12 inches on centers in both directions. The walls would be designed in pairs opposite each other with the wall base abutting the 10-inch-thick invert slab. This type of design would provide any reactive force required for stability and would prevent sliding. For U-type retaining walls, the footings would extend to the centerline.

59. Both L-walls and U-walls would be designed for two conditions of loading: Condition 1 (for case channel empty), and Condition 2 (for case channel full). For Condition 1 loading, earth pressure on the back of the wall would be determined in accordance with criteria contained in Civil Works Engineer letter 64-7, 22 April 1964, subject: "Construction Stresses in Retaining Walls." The lateral earth pressure would be computed for a condition of drained backfill. The condition of the backfill behind the wall varies. In some areas, there is a 2-foot berm with a sloping surcharge. In another area, the top of the backfill is lower than the top of the wall. All these backfill conditions would be considered in the design.

60. Two designs would be checked for Condition 1 loading. The first design consists of a triangular distribution of the horizontal earth pressure against the wall stem. The second design would include an equipment loading surcharge in addition to the earth pressure. The surcharge loading would be 200 psf at the top of the wall decreasing to 0 psf at a distance down from the top of wall equal to 200 divided by the unit lateral earth pressure, Kw. The allowable stress for this condition of loading would be increased by 25 percent. For both designs, a friction force with a coefficient equal to the tangent of 3/4 the angle of internal friction of the backfill material would be assumed to act on the back of the wall stem. Straight-line distribution of soil pressure would be assumed in the design of the wall footings. The most critical loading of the two designs would govern for Condition 1 loading.

61. For Condition 2 loading, the hydrostatic pressure of 62.5 pounds per square foot per foot of depth on the channelward side of the wall would be balanced, or reduced where the backfill is lower than the top of wall, by the passive lateral earth pressure acting on the back of the wall. Minimum vertical reinforcing steel in the channelward face of the wall would consist of either reinforcing bars 1/2 inch in diameter and spaced on 2-foot centers or reinforcing bars comprising 10 percent of the vertical steel in the back of the wall, whichever gives the greater area of steel. Where the fill is below the top of the wall, the required area of steel would be determined by design analysis. The walls would be investigated for seismic forces (Earthquake Zone 4) in accordance with EM 1110-2-2502.

62. Covered channel. The double-barrel covered section would be a reinforced concrete box designed to carry vertical earth loads, lateral earth pressures, hydrostatic pressures, foundation pressures, and live loads. The lateral

active pressures on the side of the box would be determined by the Rankine theory. The friction of the earth backfill on the wall would not be considered, and a straight-line distribution for foundation pressures would be used. The live loads would be distributed in accordance with the standard specifications of American Association of State Highway and Transportation Officials (AASHTO) for HS 20-44 design loading. Axial forces due to vertical loads and horizontal earth pressures would be considered in the design.

63. Transition structures. Transition structures would be provided where the section changes from a covered box section to the four existing 7 ft. diameter RCP sections and from a rectangular section to a trapezoidal section. Transition structures would be designed with either "L" or "T" type channel walls or as a covered channel. Design conditions would be the same as described under the heading "Rectangular Channel" or "Covered Channel".

64. Bridges. In accordance with requirements of local cooperation, local interests would provide for the design and construction or modification of existing bridges, the removal and replacement of existing paving, and the construction of detours where required. Provisions for existing side drains and proposed utility lines (gas, electric, water and sewer) would be incorporated into the design of bridges, where applicable. The highway bridges would be designed in accordance with AASHTO standard specifications for HS 20-44 loading.

65. 4th Avenue bridge. The 4th Avenue bridge, at approximate station 100+04, would be designed as a single-barrel box culvert. The clear roadway width would be 64 feet with 6-foot-wide sidewalks on each side. The bridge would be designed for a clear span of 20 feet. The single-barrel box would be designed the same as the covered section.

66. 5th Avenue bridge. The 5th Avenue bridge, at approximate station 86+04, would be designed the same as the 4th Avenue bridge except the clear roadway width would be 28 feet with 6-foot-wide sidewalks on each side; the clear span would be 18 feet.

67. Broadway Avenue bridge. The Broadway Avenue bridge (station 72+00±) would be designed the same as the 4th Avenue bridge except that the clear roadway would be 80 feet with 6-foot-wide sidewalks on each side; the clear span would be 18 feet.68. Access bridge. The access bridge owned by San Diego Gas and Electric Company, at approximate station 33+80, would have a clear roadway width of 20 feet without sidewalks. Two spans of 46 feet each would be supported by a 9-foot-high central pier and two abutments located on top of the levees. In order to eliminate fixity and thereby minimize the size of the supports, the spans would bear on elastomeric pads. Each span would be comprised of three 36-inch-deep prestressed concrete "I" girders spaced 7.25 feet center to center, with a 6-1/2-inch cast-in-place concrete deck. Cast-in-place concrete handrails 2.75 feet high would be provided on top of the 9-inch-high concrete curbs.

69. Drop structure. A drop structure would be provided at the outlet of the trapezoidal channel. The drop structure would be a reinforced concrete trapezoidal section extending from station 25+35 to station 24+63. Dentates

signed to withstand hydraulic forces would be provided at the locations shown on the drawings.

UTILITY RELOCATIONS

70. In accordance with requirements of local cooperation, local interests would bear the costs of relocating all utilities which would interfere with channel construction. Utility relocations would consist of the relocation or modification of existing gas, fuel oil, water, sewer, power, and communication lines. The utility relocations would be routine and would not present unusual problems that would influence the channel location, profile, or cross section. The relocation work would be carefully phased with channel construction in order to avoid any delays. Pertinent information on utilities is given in the following table.

Telegraph Canyon Channel
Tabulation of Interferring Utilities

Approximate Location	Description	Owner	Action
	Gas Lines		
Sta 100+04	1 1/2" High pressure line	San Diego Gas & Electric Co.	Relocate
Sta 86+04	1 1/2" High pressure line	San Diego Gas & Electric Co.	Relocate
Sta 86+04	12" High pressure line	San Diego Gas & Electric Co.	Relocate
Sta 86+04	2" High pressure line	San Diego Gas & Electric Co.	Relocate
Sta 72+00	2" High Pressure line	San Diego Gas & Electric Co.	Relocate
Sta 37+30	8" Gas line (400 psi)	San Diego Gas & Electric Co.	Protect in place
Sta 26+13	16" Gas line (400 psi)	San Diego Gas & Electric Co.	Protect in place
Sta 26+00	24" Gas line (400 psi)	San Diego Gas & Electric Co.	Protect in place
	Steamline		
Sta 27+00 to Sta 26+25	10" Steamline and associated pipes	San Diego Gas & Electric Co.	Protect in place
	Fuel Oil		
Sta 38+43	10" line	San Diego Gas & Electric Co.	Relocate
	Power Facilities		
Sta 100+27	Utility Manhole	San Diego Gas & Electric Co.	Relocate
Sta 100+27	Pole	San Diego Gas & Electric Co.	Protect in place
Sta 85+78	Pole	San Diego Gas & Electric Co.	Protect in place
Sta 39+34	Pole	San Diego Gas & Electric Co.	Protect in place
Sta 39+03	Light pole & underground electric	San Diego Gas & Electric Co.	Protect in place
Sta 33+90	Light pole & underground electric	San Diego Gas & Electric Co.	Protect in place
Sta 30+18 to Sta 28+18	7-Power poles and underground electric	San Diego Gas & Electric Co.	Protect in place
Sta 26+24	Exposed electric underground	San Diego Gas & Electric Co.	Protect in place
Sta 23+40	Power pole, transformer and underground electric	San Diego Gas & Electric Co.	Protect in place
Sta 20+75	Light pole & underground electric	San Diego Gas & Electric Co.	Protect in place

Communication facilities

Sta 85+70	Buried conduit	Pacific Telephone	Protect in place
Sta 85+70	Pole	Pacific Telephone	Protect in place

Water Lines

Sta 100+04	6" Waterline at 4th Ave bridge	Sweetwater Authority	Relocate
Sta 86+04	6" Waterline at 5th Ave bridge	Sweetwater Authority	Relocate
Sta 72+00	8" Waterline at Broadway bridge	Sweetwater Authority	Relocate

Sewer Lines

Sta 86+04	Manhole + 8" VCP Sewerline	Montgomery Sanitation District	Relocate
Sta 71+60	8" Sewerline	San Diego County	Relocate
Sta 50+82	15" Sewerline and manhole	Chula Vista City	Relocate
Sta 28+35	6" PVC sewer force main	San Diego Gas & Electric Co.	Protect in place
Sta 26+18	6" Forceline & 6" gravity line sewerline	San Diego Gas & Electric Co.	Abandoned

DIVERSION AND CONTROL OF WATER DURING CONSTRUCTION

71. The Telegraph Canyon Creek is a nonperennial stream which flows only during the precipitation season between November and April and during occasional summer storms. The construction schedule is projected from April through mid November. During the construction period nuisance flow of 5 cfs would be expected nearly continuously; an additional 45 cfs might be caused by runoff of occasional showers. Proper measures are to be taken by contractors to control the water during the construction period. One possibility would be to construct approximately 2 feet of channel wall stems above the invert prior to the wall construction. The 2-foot wall stems would convey approximately 400 cfs.

72. Dewatering would not be required to excavate or construct the proposed improvements above station 40+00±; however, dewatering would be required below station 40+00±. Refer to paragraph titled "Dewatering" (Geology and Soils).

REAL ESTATE REQUIREMENTS

73. As required by the authorizing legislation, local interests would acquire rights-of-way and areas required for temporary use during construction of the project. The residential property lines generally extend to the center of the existing creek with residential development, including swimming pools, paralleling the creek. The proposed channel alinement is the result of many studies that had the goal of minimizing social impact to the property owners, thereby reducing the project cost.

74. The proposed rectangular channel would have an 18-foot base width through most of the reach. A preliminary survey of land available for project construction revealed that a permanent right-of-way width of 40 feet was all that would be available without acquiring costly homes. It was determined that for this project reach, the normally required 15-foot berms would be reduced to 2 feet and that the permanent excavation line would generally extend from the right-of-way line to the berm.

75. The estimated cost of $820,000 for land, easements, and rights-of-way, based on the above plan, was developed by the Real Estate Division. The costs of rights-of-way, which include acquisition costs, were based on costs of development projected in fiscal year 1983.

SCHEDULE FOR DESIGN AND CONSTRUCTION

76. Preparation of plans and specifications. If funds are made available, contract plans and specifications would require 12 months to prepare and would be initiated in the first quarter of FY 1984.

77. Construction period. The recommended construction of the project would be initiated in the third quarter of FY 1985 (if construction funds are made available) and would be completed about 9 months later. Because of the possible impact of construction on the wildlife habitat in the J Street marsh, at the request of U.S. Department of Interior, Fish and Wildlife Service,

construction between Station 25+35 and Station 19+83.43 would be undertaken between September and March.

OPERATION AND MAINTENANCE

78. Operation and maintenance. Assurances have been obtained from local interests to accept the completed facilities after construction and to operate and maintain them in accordance with Federal regulations. Maintenance would include adequate measures to prevent any encroachment from interfering with proper functioning of the project. Provisions would be made for establishment of vegetation in the earth-bottom channel that would be beneficial to wildlife and create an attractive appearance. Average annual operation and maintenance charges for the plan have been developed by input from representatives of the San Diego County Sanitation and Flood Control Department and are estimated at $9,000.

COST ESTIMATE

79. General. The estimated first costs for the recommended plan include estimates for construction, engineering and design, supervision and administration, relocations, right-of-way, esthetic treatment, and allowance for contingencies.

80. Unit prices. Unit prices were developed by using current material, equipment, and labor costs typical of work of this nature in the vicinity of the site of the recommended plan. Unit prices are based on costs prevailing in April 1983.

81. Summary of estimated first costs of the project. The total first costs for the project as recommended in this report are estimated at $4,850,000, of which $3,620,000 are a Federal cost and $1,230,000 are a non-Federal cost.

82. A summary of the estimated first costs for the project, based on April 1983 price levels, is given in table F-3.

83. Detailed estimate of first costs. Detailed estimate of first costs for construction of the project, based on April 1983 prices, is given in table F-4.

Table F-3

Summary of estimated first costs
(April 1983 price levels)

Cost Acct No.	Item	Amount	
	FEDERAL COSTS		
09	Channels	$3,132,000	
30	Engineering and design	278,000	
31	Supervision and administration	250,000	
	Total, Federal		$3,660,000
	NON-FEDERAL COSTS		
	Lands, easements, and rights-of-way	$ 820,000	
	Relocations - utilities	100,000	
	Relocations - bridges	310,000	
	Total, non-Federal		$1,230,000
	Total, project first costs		$4,890,000

Table F-4

Detailed first cost estimate
(April 1983 price levels)

Cost Acct. No.	Description	Quantity	Unit	Unit Cost	Cost
Construction					
09	Rectangular channel (Sta. 106+00 to Sta. 67+40)				
	Diversion and control of water	1	Job	LS	74,000
	Clearing and grubbing	2.90	Ac.	1,100	3,190
	Fencing	7,550	LF	8.30	62,665
	Earthwork				
	Excavation	42,500	cy	2.50	106,250
	Compacted Fill	26,500	cy	1.00	26,500
	Haul excess earth	10,700	cy	1.25	13,375
	Concrete				
	Invert slab	3,230	cy	70.00	226,100
	Side walls	2,800	cy	84.00	235,000
	Wing walls	490	cy	84.00	41,160
	Cement	36,600	cwt	4.70	172,000
	Reinforcing steel	667,000	lbs	0.45	300,150
	Stonework				
	18" revetment	20	cy	36.00	1,008
	Bedding material	14	cy	17.00	204
	15" Grouted stone	200	cy	56.00	11,200
	Cement	1,470	cwt	4.70	6,909
	Contingencies				153,069
	Esthetic treatment *				40,000
	Subtotal				1,473,000
09	Box section (Sta. 67+40 to Sta. 52+17)				
	Diversion and control of water	1	Job	LS	33,700
	Clearing and grubbing	1.20	Ac.	1,100	1,320
	Fencing	2,920	LF	8.30	24,236
	Earthwork				
	Excavation	27,500	cy	2.50	68,750
	Compacted fill	10,200	cy	1.00	10,200
	Haul excess earth	15,200	cy	1.25	19,000
	Concrete				
	Invert slab	1,510	cy	70.00	105,700
	Walls	1,430	cy	84.00	120,120
	Roof slab	710	cy	150.00	106,500
	Cement	20,600	cwt	4.70	96,820
	Reinforcing steel	533,000	lbs	0.45	239,850

Table F-4 (Continued)

Cost Acct. No.	Description	Quantity	Unit	Unit Cost	Cost
	Contingencies				99,804
	Subtotal				925,000
09	Trapezoidal channel (Sta. 39+67 to Sta. 19+83.43)				
	Diversion and control of water	1	Job	LS	44,300
	Clearing and grubbing	4.36	Ac.	1,100	4,800
	Fencing	4,050	LF	8.30	33,615
	Earthwork				
	Excavation	23,900	cy	1.50	35,850
	Compacted Fill	3,770	cy	0.90	3,393
	Haul excess earth	19,400	cy	1.25	24,250
	Concrete				
	Invert slab	760	cy	70.00	53,200
	Side slopes	1,680	cy	84.00	141,120
	Walls	70	cy	210.00	14,700
	Baffle blocks	42	ea	400.00	16,800
	Cement	14,700	cwt	4.70	69,090
	Reinforcing steel	150,500	lbs	0.45	67,725
	Stonework				
	12" Revetment	1,720	cy	21.00	36,120
	Bedding material	860	cy	17.00	14,620
	15" Grouted stone	780	cy	56.00	43,680
	Cement	5,700	cwt	4.70	26,790
	Subdrain system	1,500	LF	17.00	25,500
	Contingencies				78,447
	Subtotal				734,000
	Total channels				3,132,000
30	Engineering and design				278,000
31	Supervision and administration				250,000
	Total, Federal				3,660,000

* See Table G-1, Appendix G for Detail Cost Estimate of Esthetic treatment

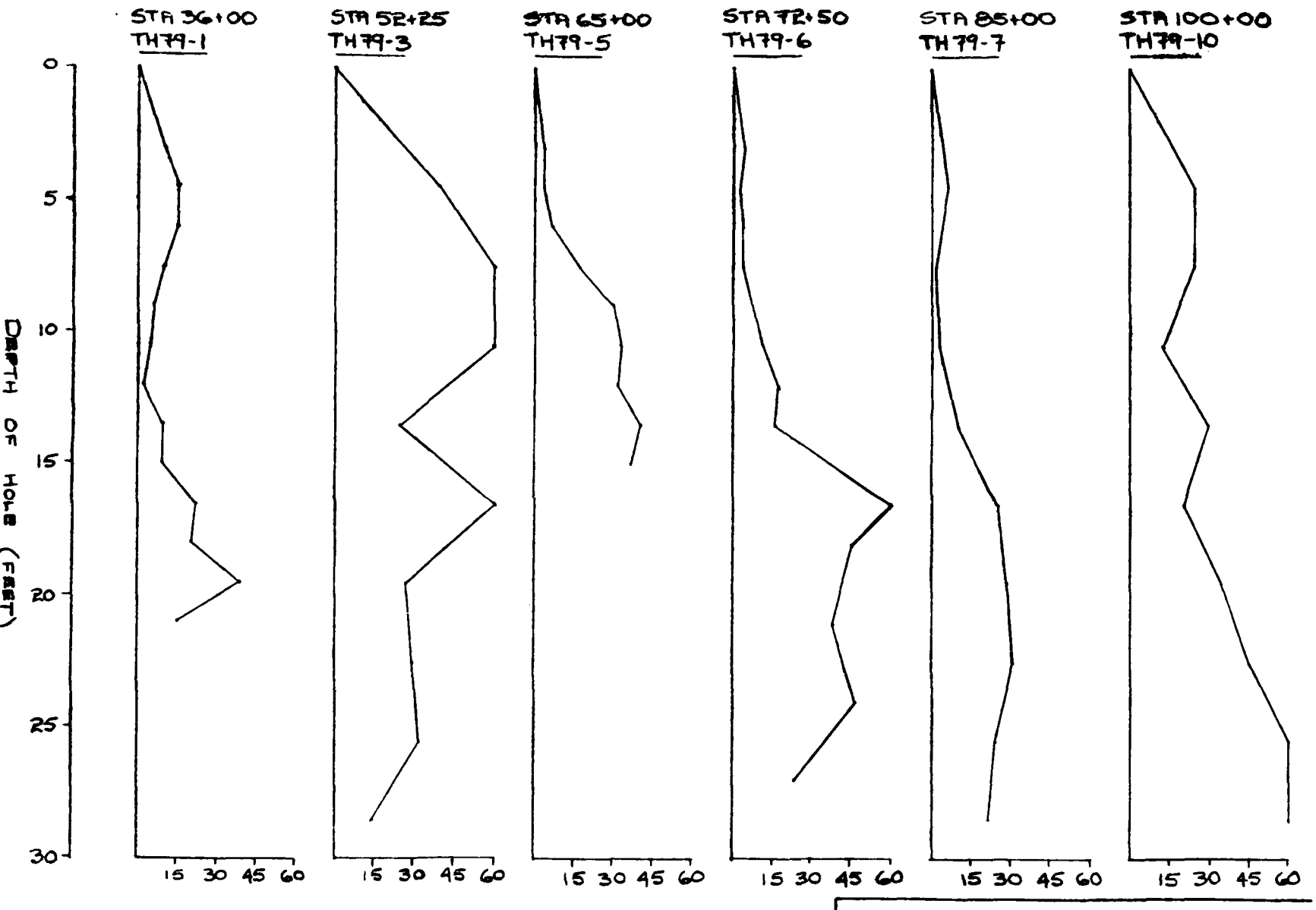
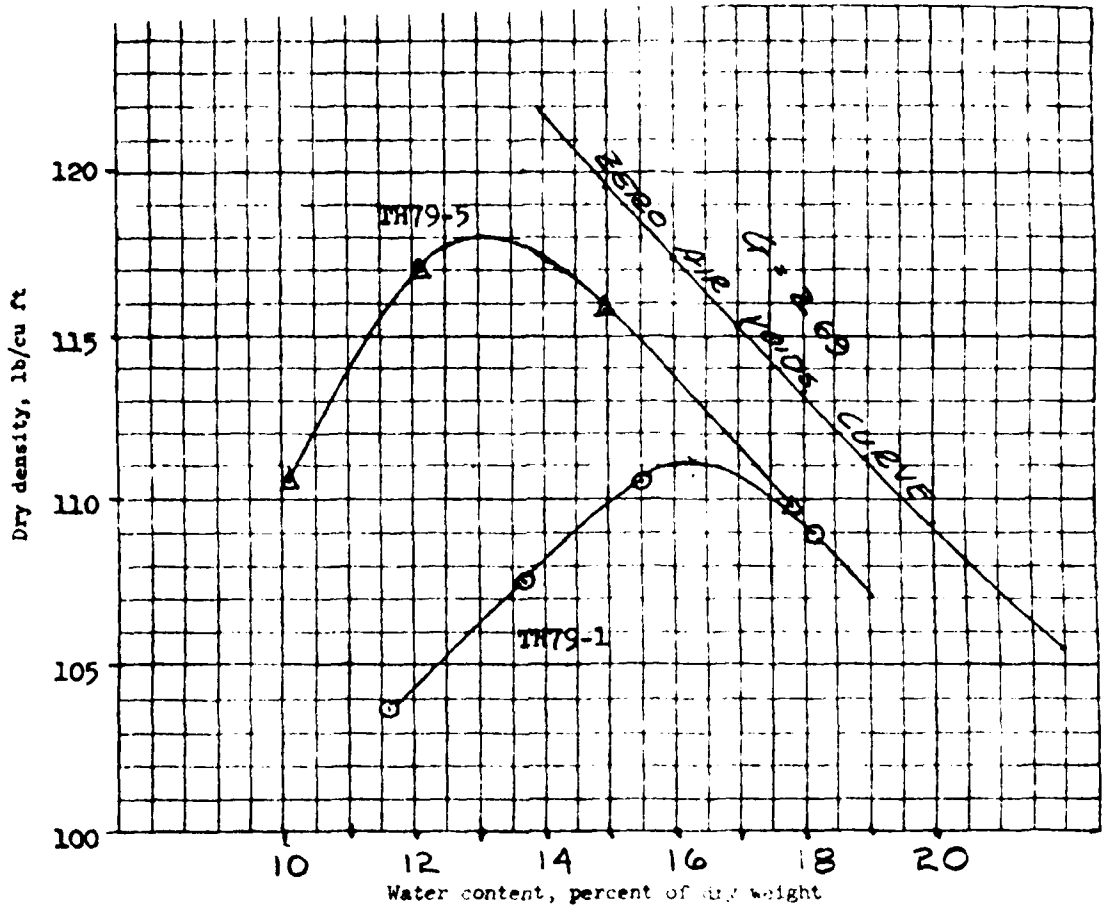


FIGURE F-1

TELEGRAPH CREEK
BLOW COUNT VS. DEPTH



Standard compaction test

25 blows per each of 3 layers, with 5½ lb rammer and

12 inch drop. 4 inch diameter mold

Sample No.	Elev or Depth	Classification	G	LL	PL	% > No. 4	% > 3/4 in.
79-1		Sandy Clay(CL)	2.69	38	18	0	0
79-5		Sandy Clay(CL)	2.69	32	15	3	2

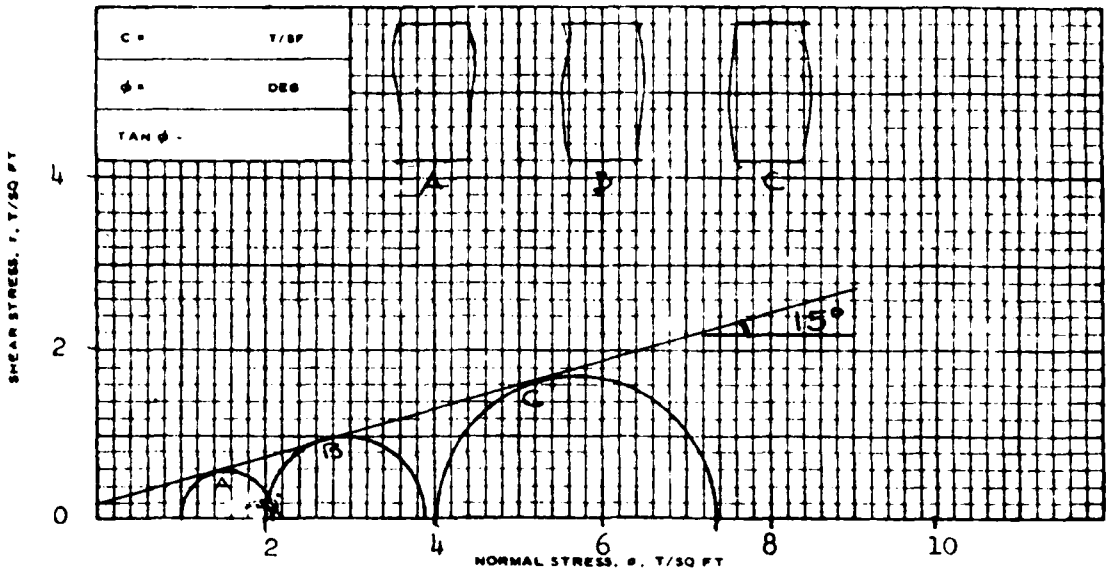
Sample No.	79-1	79-5		
Natural water content, percent	⊙	△		
Optimum water content, percent	16.3	13.0		
Max dry density, lb/cu ft	111.1	118.1		

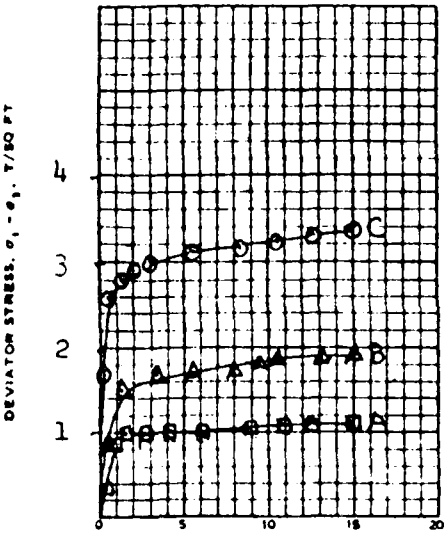
Remarks	Project TELEGRAPH CANYON CREEK
Div.No. Hole No.	
⊙ 70424 TH 79-1	Area
△ 70425 TH 79-5	Boring No. TH79-1 & 5 — Date March 1979
	COMPACTION TEST REPORT

ENG FORM 1 JUN 68 2091 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE

TRANSLUCENT

FIGURE F-2





SPECIMEN NO.			A	B	C
INITIAL	WATER CONTENT, %	w_o	16.4	16.6	16.7
	DRY DENSITY LB/CU FT	γ_{d_o}	105.0	104.8	104.7
	SATURATION, %	S_o	74	74	74
	VOID RATIO	e_o	0.599	0.602	0.603
BEFORE SHEAR	WATER CONTENT, %	w_c	21.0	20.1	17.8
	DRY DENSITY LB/CU FT	γ_{d_c}	107.3	109.0	113.5
	SATURATION, %	S_c	100	100	100
	VOID RATIO	e_c	0.564	0.540	0.479
	FINAL BACK PRESSURE, T/SQ FT	u_c	7.20	7.20	7.20
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.00	2.00	4.00
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	1.14	1.92	3.39
TIME TO $(\sigma_1 - \sigma_3)_{max}$ MIN		t_f	351	385	383
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$	-	-	-
INITIAL DIAMETER, IN		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN		H_o	6.45	6.45	6.45

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Sandy Clay(CL)

LL	PL	PI	G_s
38	18	20	2.69

TYPE OF SPECIMEN Remolded TYPE OF TEST R

REMARKS

PROJECT TELEGRAPH CANYON CREEK Debris Basin

BORING NO. 79-1 SAMPLE NO. 7048

DEPTH/ELEV

LABORATORY SPDL DATE March 1979

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

FIGURE F-3

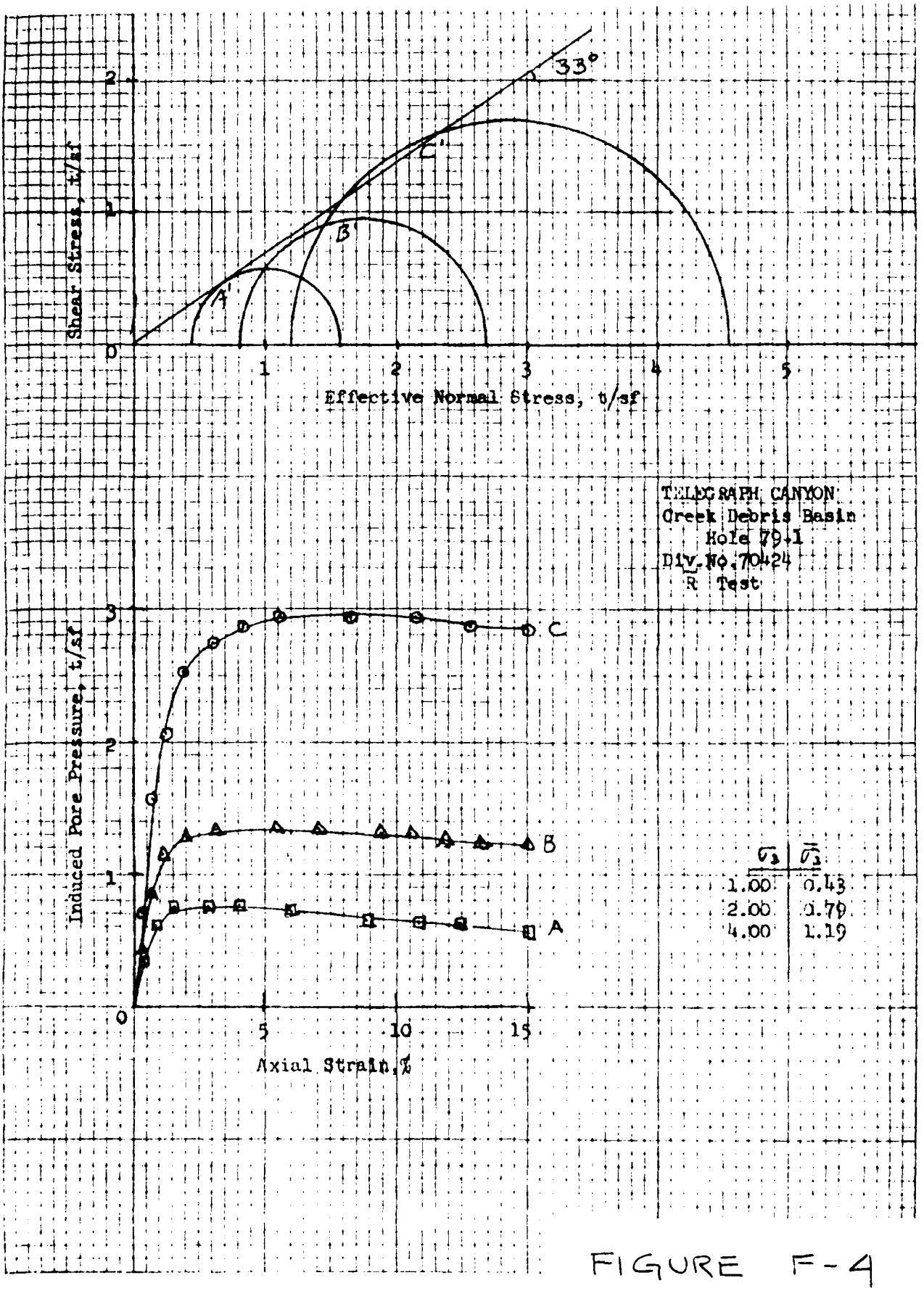
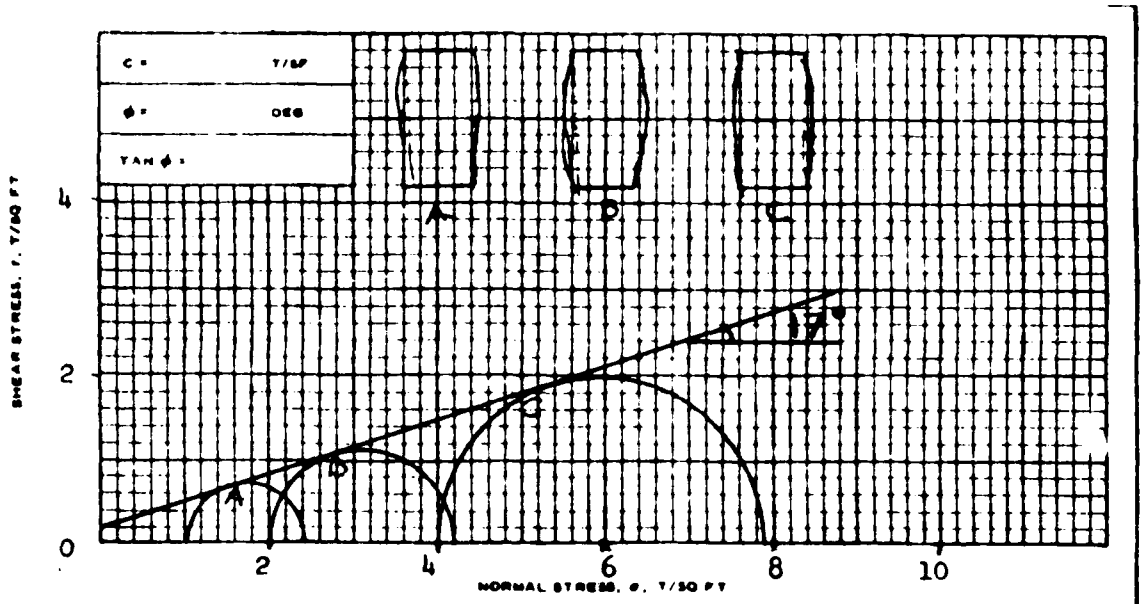
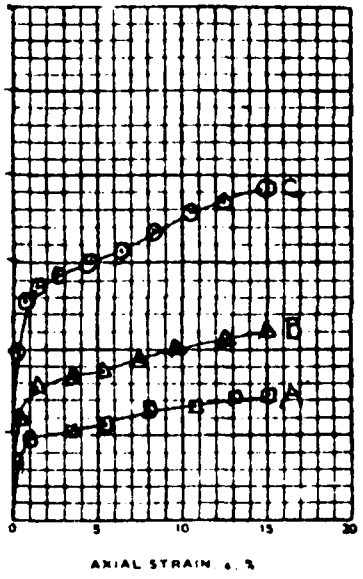

33°
A'
B'
C'
Shear Stress, t/sf
Effective Normal Stress, t/sf
TELEGRAPH CANYON
Creek Debris Basin
Hole 79-1
Div. No. 70424
R Test
Induced Pore Pressure, t/sf
Axial Strain, %
A
B
C
σ3 | σ̄3
1.00 | 0.43
2.00 | 0.79
4.00 | 1.19

FIGURE F-4





SPECIMEN NO.			A	B	C
INITIAL	WATER CONTENT, %	w_o	13.7	13.6	13.6
	DRY DENSITY LB/CU FT	γ_{d_o}	111.9	112.0	112.0
	SATURATION, %	S_o	74	73	73
	VOID RATIO	e_o	0.500	0.490	0.499
BEFORE SHEAR	WATER CONTENT, %	w_c	18.0	16.8	15.0
	DRY DENSITY LB/CU FT	γ_{d_c}	113.2	115.5	119.6
	SATURATION, %	S_c	100	100	100
	VOID RATIO	e_c	0.483	0.454	0.403
	FINAL BACK PRESSURE, T/SQ FT	u_c	7.20	7.20	7.20
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.00	2.00	4.00
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	1.48	2.22	3.90
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	398	383	387
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$	-	-	-
INITIAL DIAMETER, IN		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.45	6.45	6.45

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Sandy Clay(CL)

LL 32	PL 15	PI 17	Gs 2.69	TYPE OF SPECIMEN Remolded	TYPE OF TEST $\bar{R}$

REMARKS:

Remolded to 95% of maximum density at optimum water content

PROJECT TELEGRAPH CANYON CREEK

BORING NO T1179-5 SAMPLE NO 70425

DEPTH/ELEV

LABORATORY SPDL DATE March 1979

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

FIGURE F-5

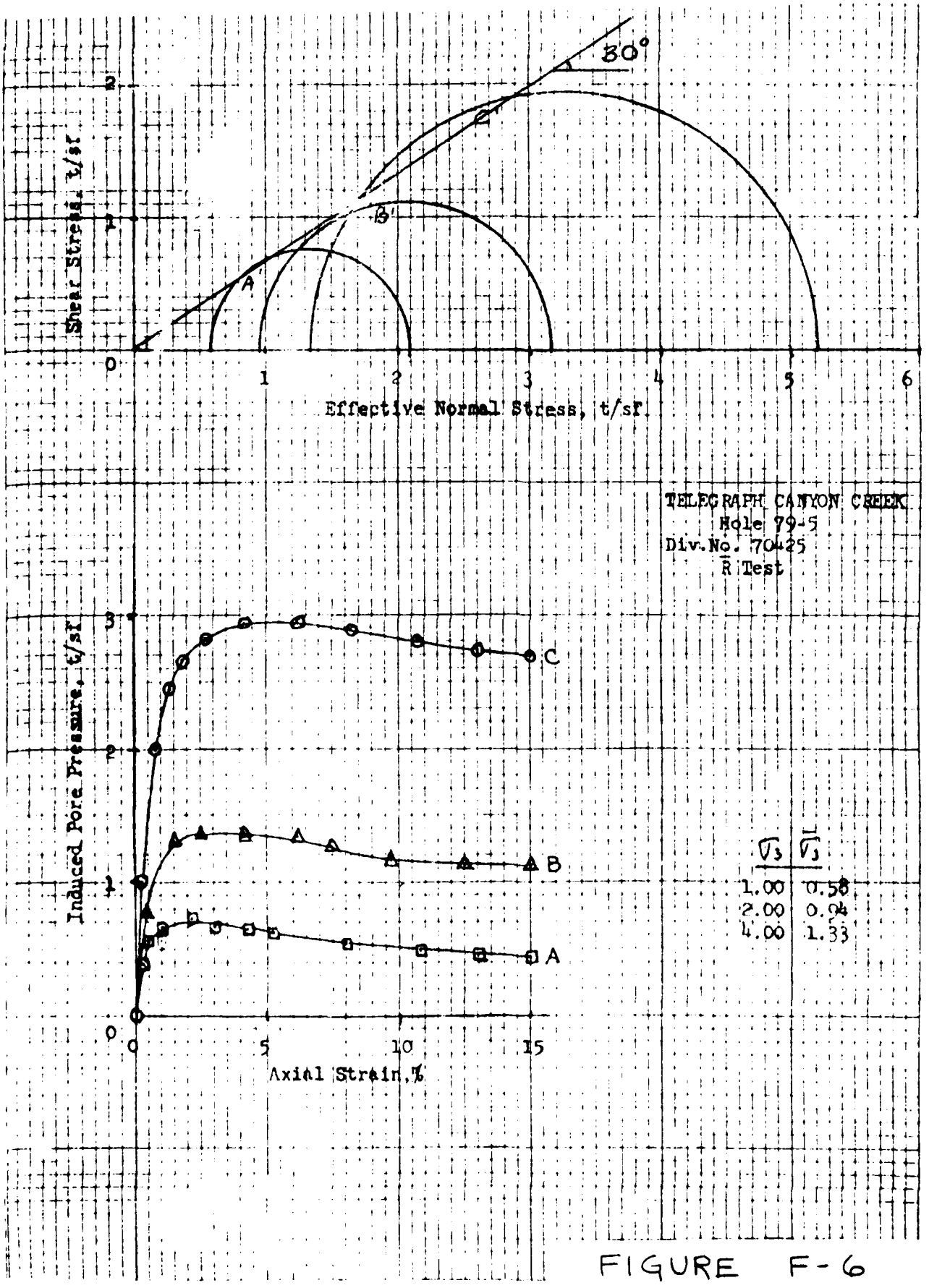

30°
A
B
C
Shear Stress, t/sf
Effective Normal Stress, t/sf
TELEGRAPH CANYON CREEK
Hole 79-5
Div. No. 70425
R Test
Induced Pore Pressure, t/sf
Axial Strain, %
$\bar{\sigma}_3$ $\bar{\sigma}_3$
1.00 0.58
2.00 0.94
4.00 1.33

FIGURE F-6

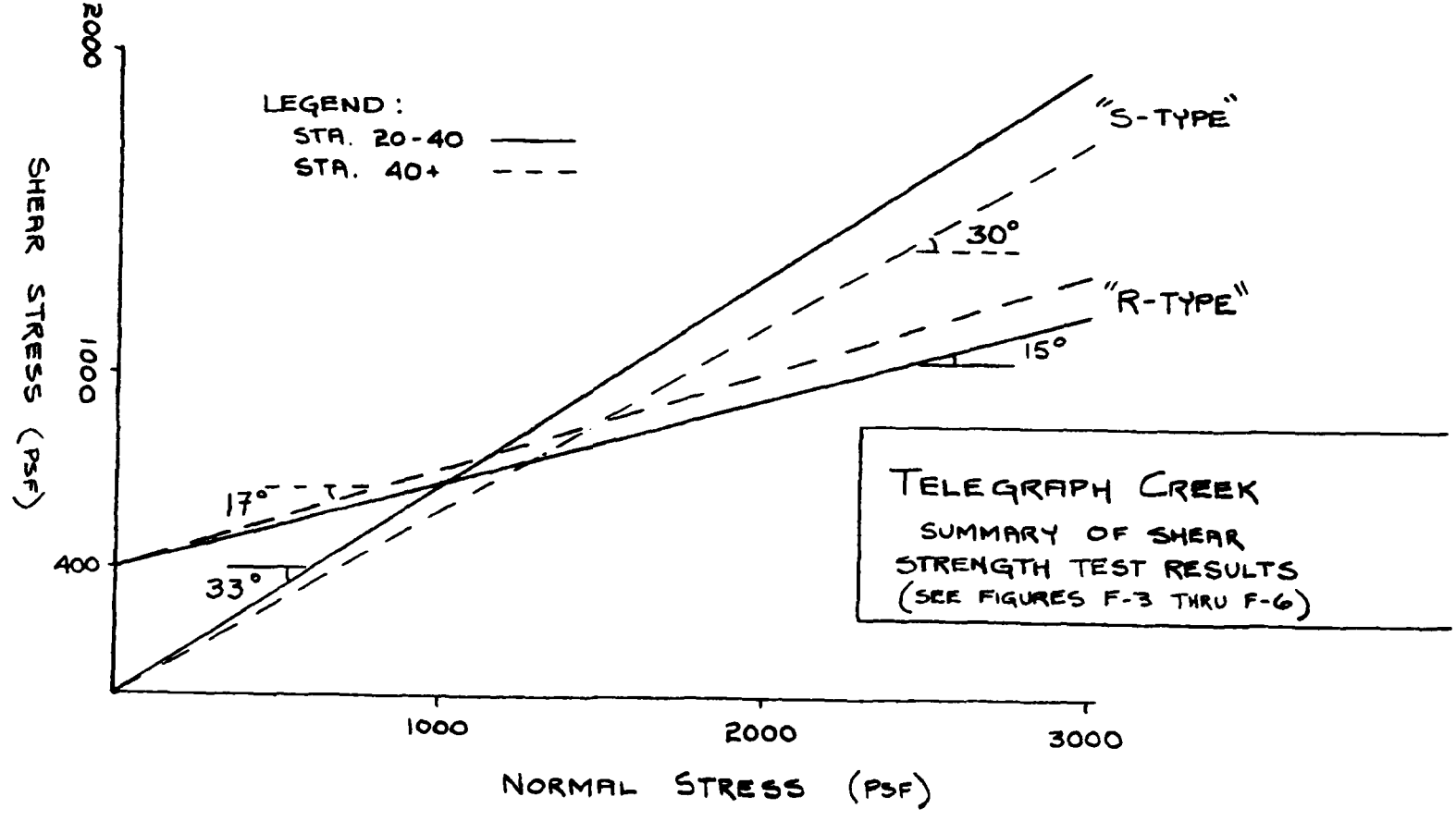

2000
1000
400
SHEAR STRESS (PSF)
LEGEND :
STA. 20-40
STA. 40+
"S-TYPE"
30°
"R-TYPE"
15°
17°
33°
1000
2000
3000
NORMAL STRESS (PSF)
TELEGRAPH CREEK
SUMMARY OF SHEAR STRENGTH TEST RESULTS
(SEE FIGURES F-3 THRU F-6)

FIGURE F-7

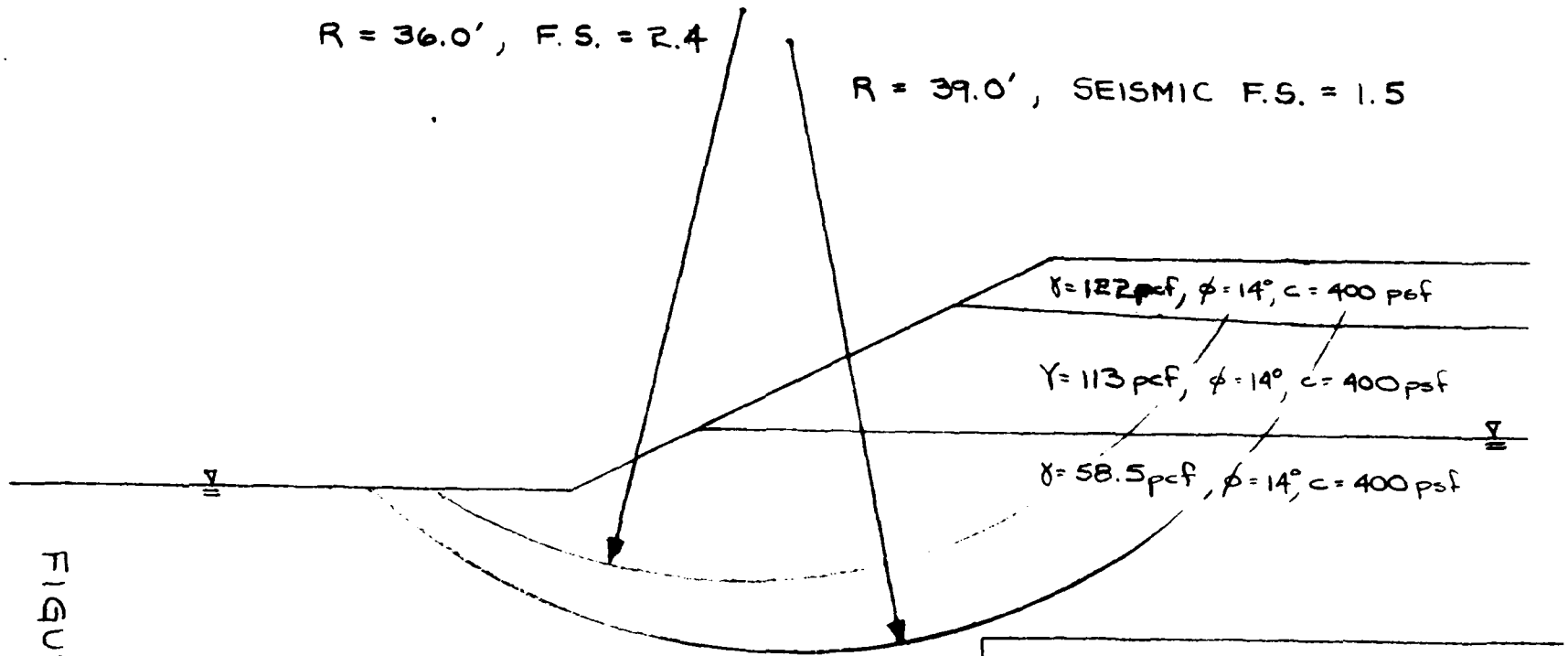
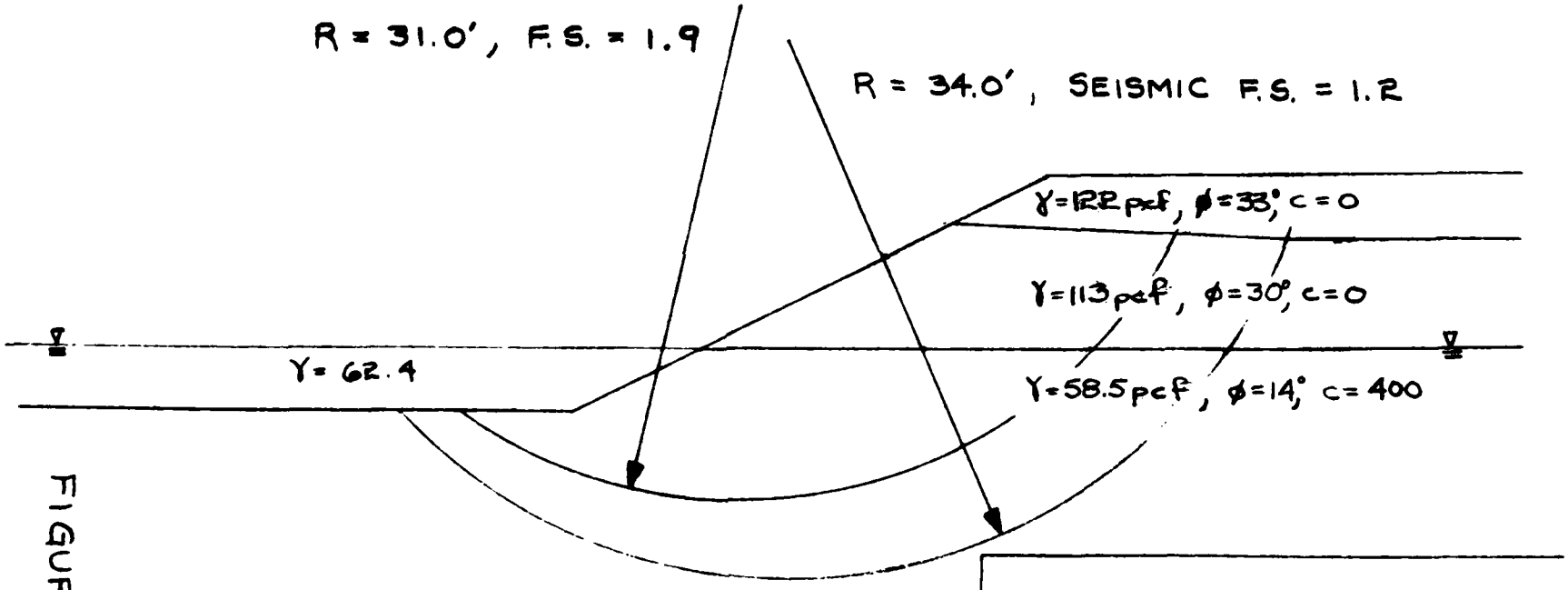


FIGURE F-8

TELEGRAPH CREEK
STABILITY ANALYSES
POST CONSTRUCTION

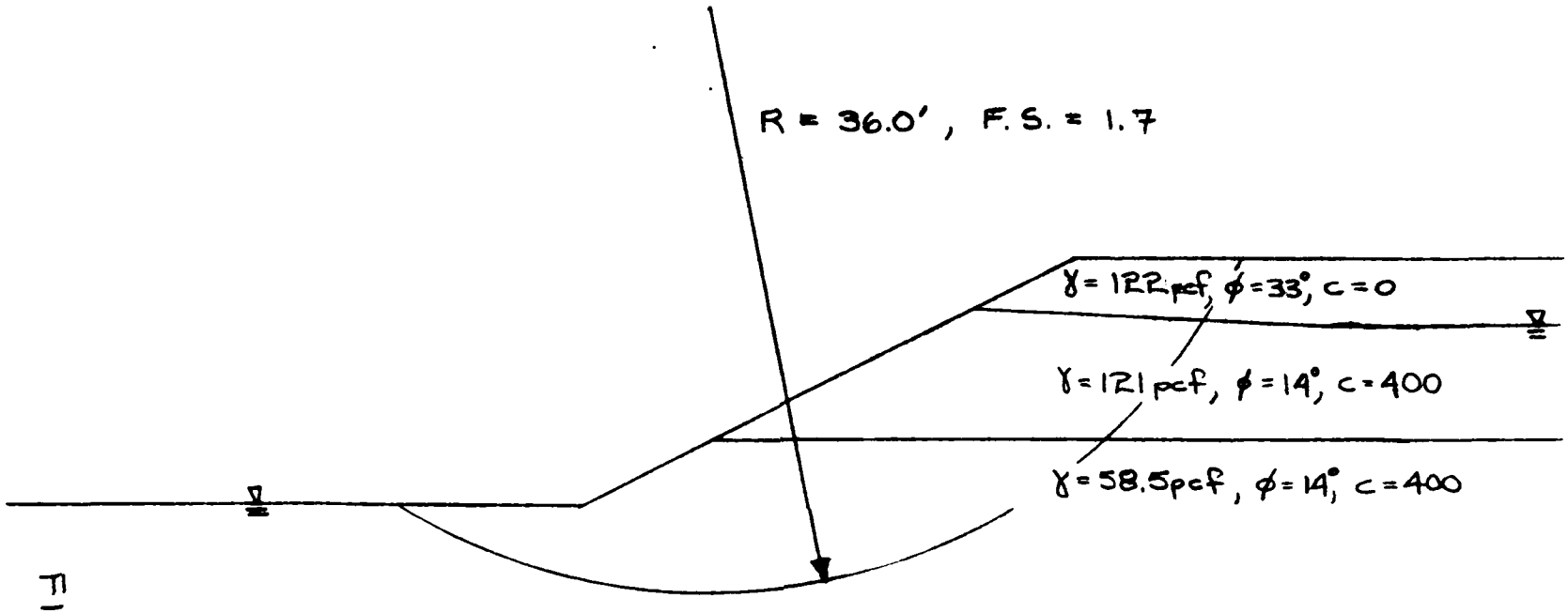


SCALE: 1" - 10'

10 0 5 10

FIGURE F-9

TELEGRAPH CREEK
STABILITY ANALYSES
PARTIAL POOL



SCALE: 1" - 10'

10 0 5 10

FIGURE F-10

TELEGRAPH CREEK
STABILITY ANALYSES
RAPID DRAWDOWN

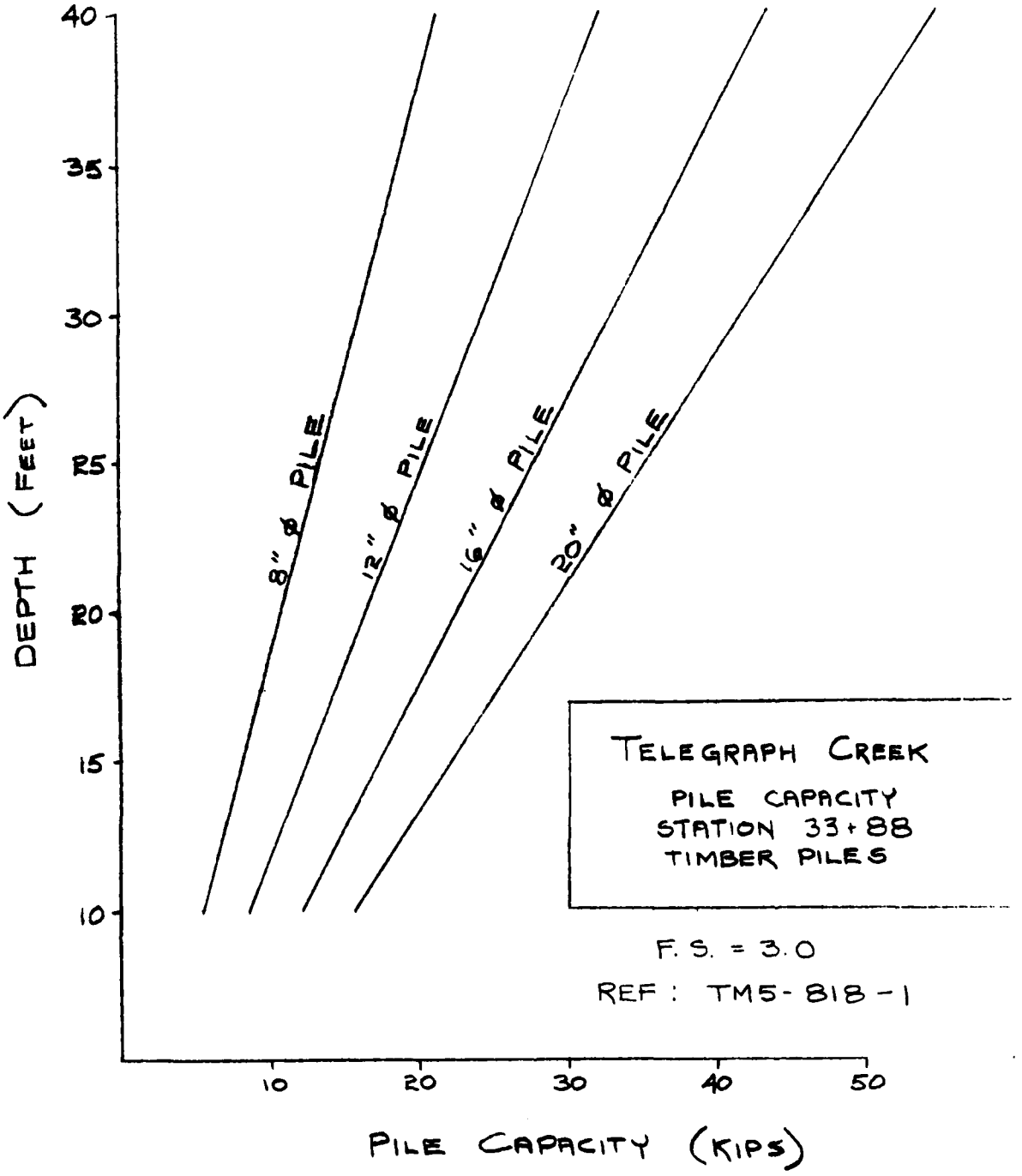

40
35
30
25
20
15
10
DEPTH (FEET)
8" ø PILE
12" ø PILE
16" ø PILE
20" ø PILE
TELEGRAPH CREEK
PILE CAPACITY
STATION 33+88
TIMBER PILES
F.S. = 3.0
REF: TM5-818-1
10
20
30
40
50
PILE CAPACITY (KIPS)

FIGURE F-11

VALUE ENGINEERING PAYS

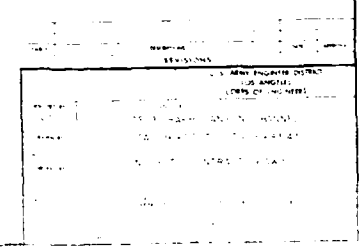
SAN DIEGO COUNTY, CALIFORNIA

TELEGRAPH CANYON CHANNEL

STA. 106+00 TO STA. 19+83.43

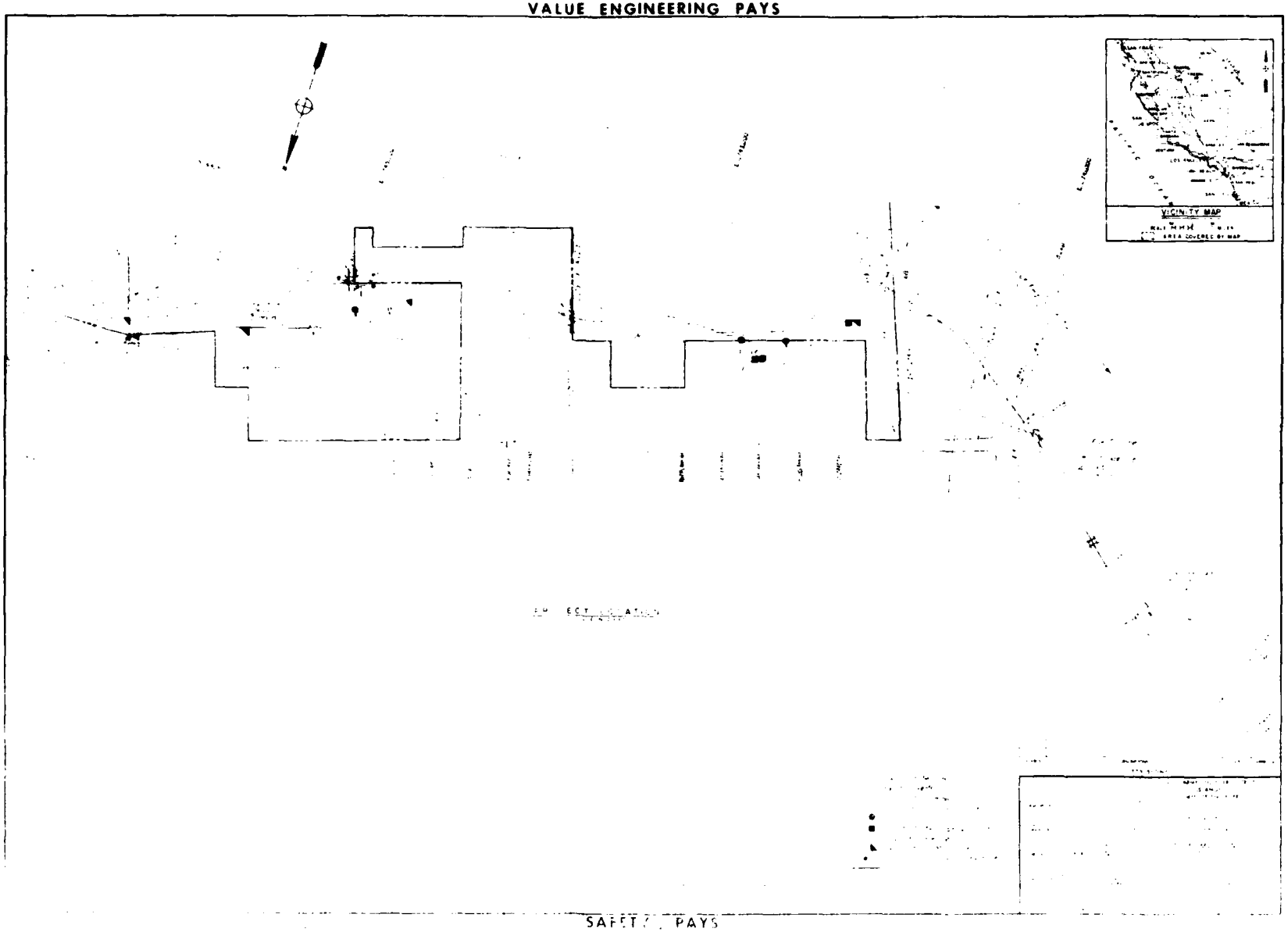
INDEX TO CONTRACT DRAWINGS

DATUM IS MEAN SEA LEVEL



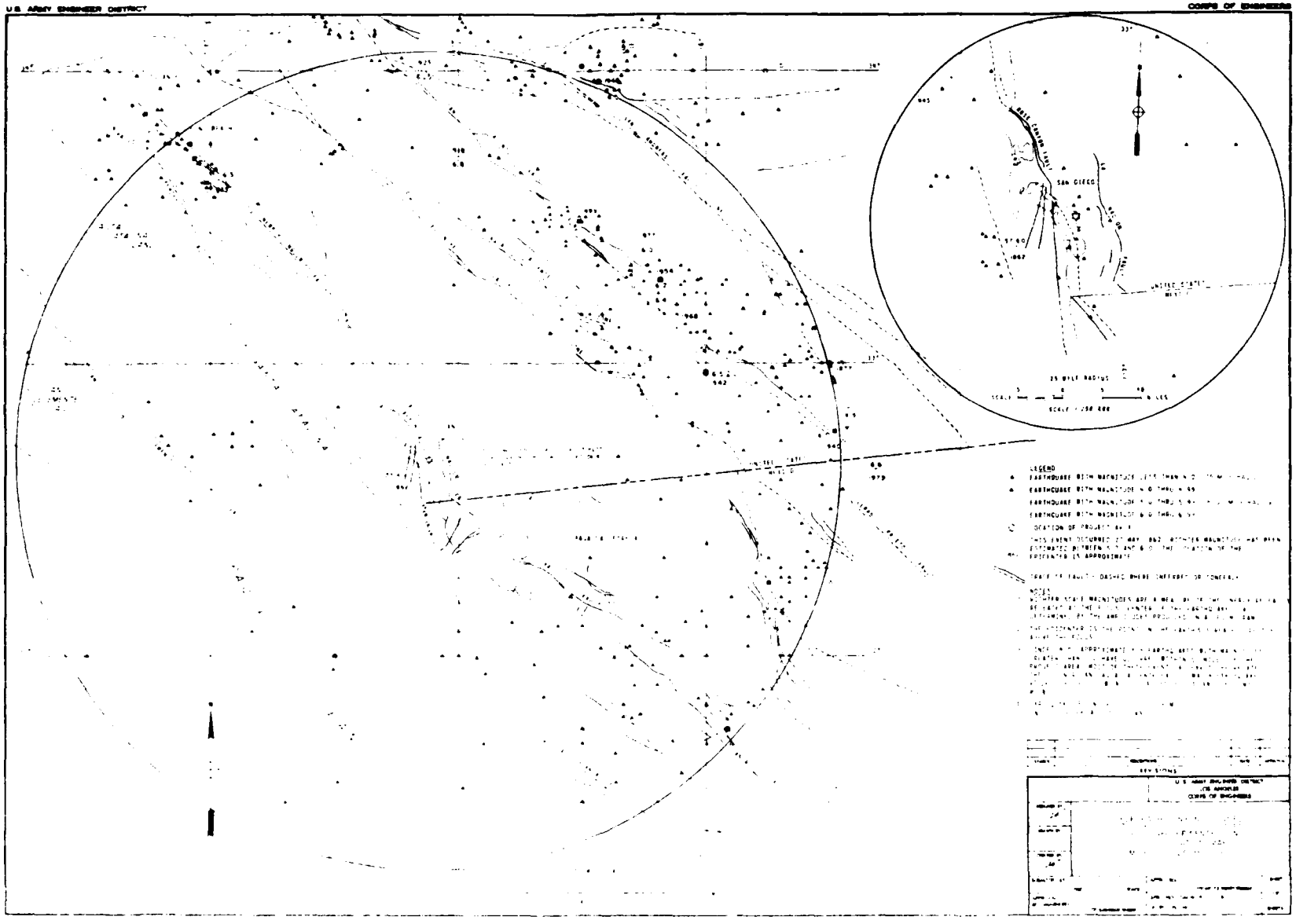
SAFETY PAYS

VALUE ENGINEERING PAYS

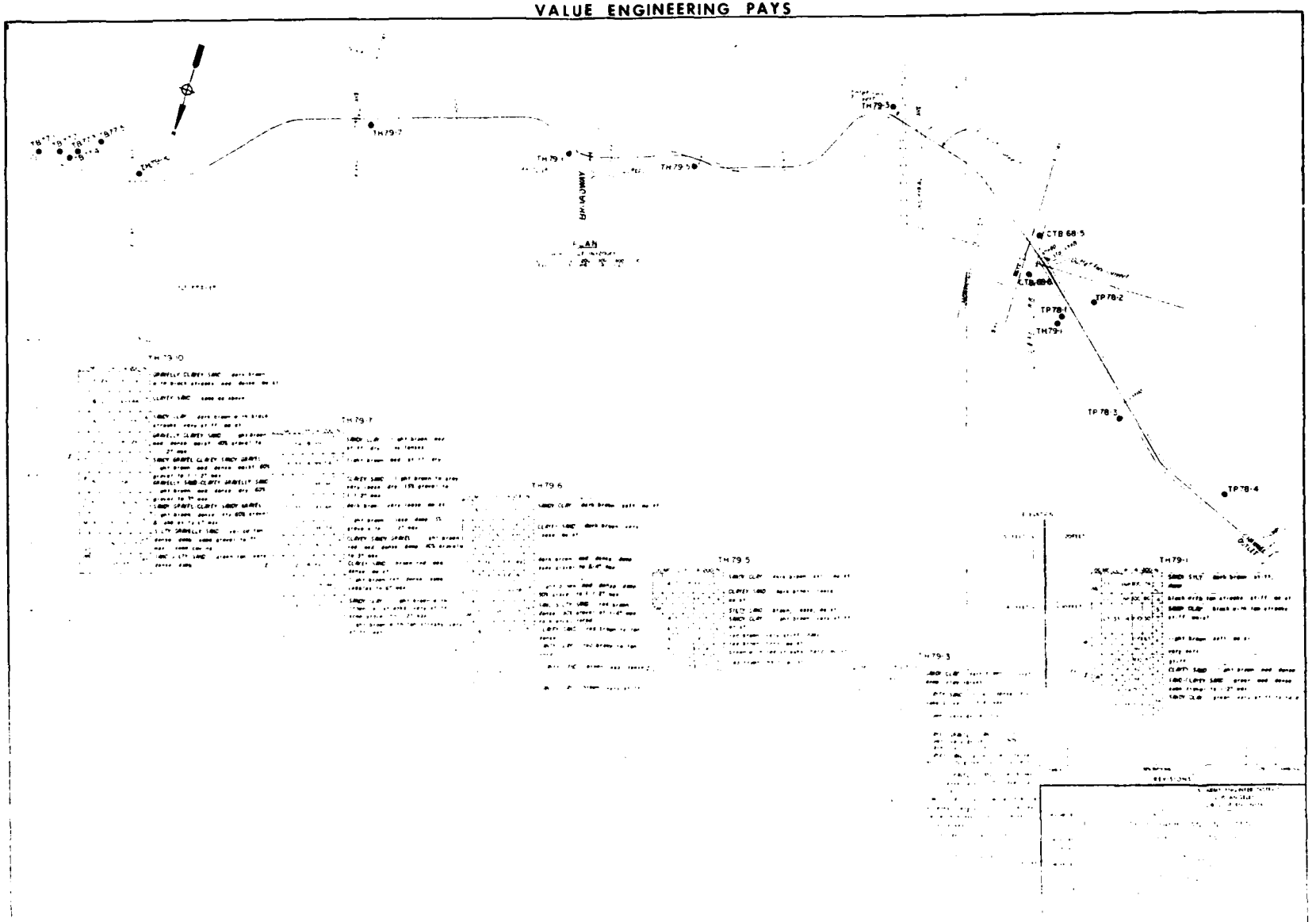


SAFETY PAYS

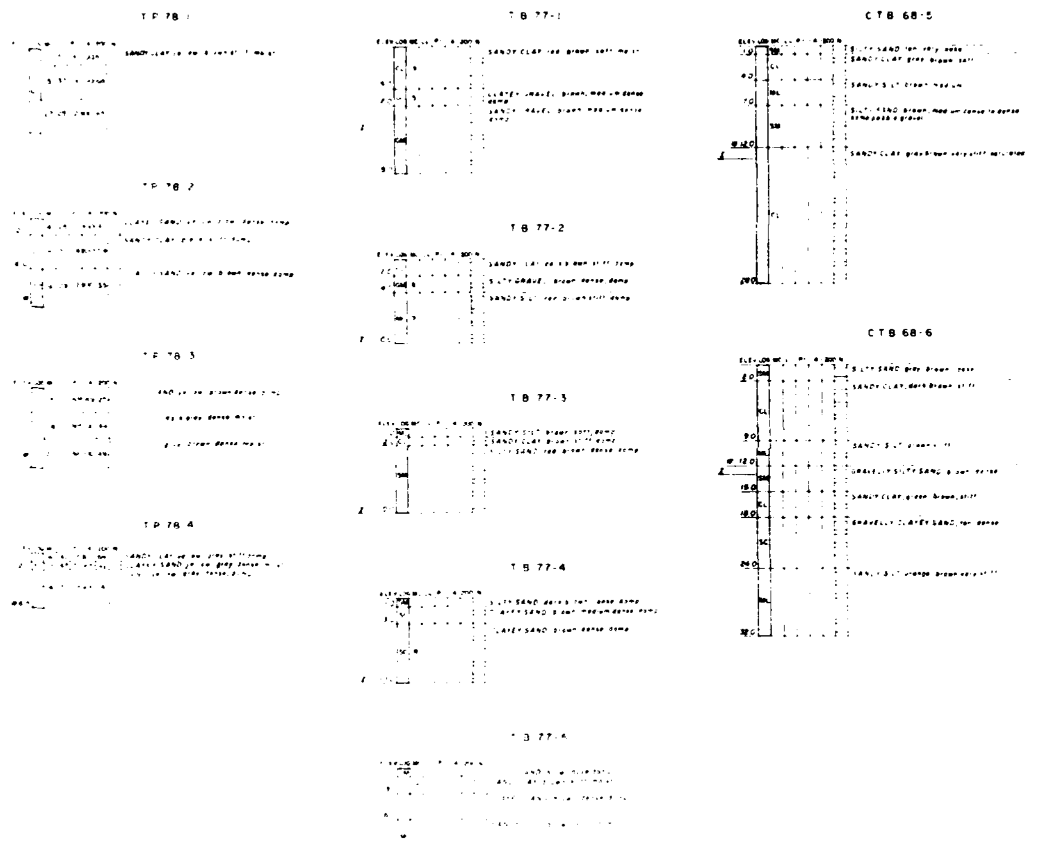
REPRODUCED AT GOVERNMENT EXPENSE


U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAN DIEGO
25 MILE RADIUS
LEGEND

VALUE ENGINEERING PAYS



SAFETY PAYS



UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS	GROUP SYMBOLS	TYPICAL NAMES
[illegible]	GW	[illegible]
	GP	[illegible]
	GM	[illegible]
	GC	[illegible]
	SW	[illegible]
	SP	[illegible]
	SM	[illegible]
	SC	[illegible]
SILTS AND CLAYS	ML	[illegible]
	CL	[illegible]
	OL	[illegible]
	MH	[illegible]
	CH	[illegible]
	OH	[illegible]
[illegible]	Pt	[illegible]

NOTES:

1. [illegible]
2. [illegible] U. S. Standard.
3. [illegible] "A" line [illegible] "A" line on the chart.
4. [illegible] dated 29 March 1976

LEGEND

TP — LOCATION AND NUMBER OF OTHER'S TEST PIT

TB — LOCATION AND NUMBER OF OTHER'S TEST BORING

CTB — LOCATION AND NUMBER OF OTHER'S TEST BORING

T.H. — LOCATION AND NUMBER OF TEST HOLE

MC — [illegible]

LL — [illegible]

PI — [illegible]

NP — [illegible]

4 — [illegible]

200 — [illegible]

N — [illegible]

DEPTH TO WATER

DEPTH TO INVERT APPROXIMATE

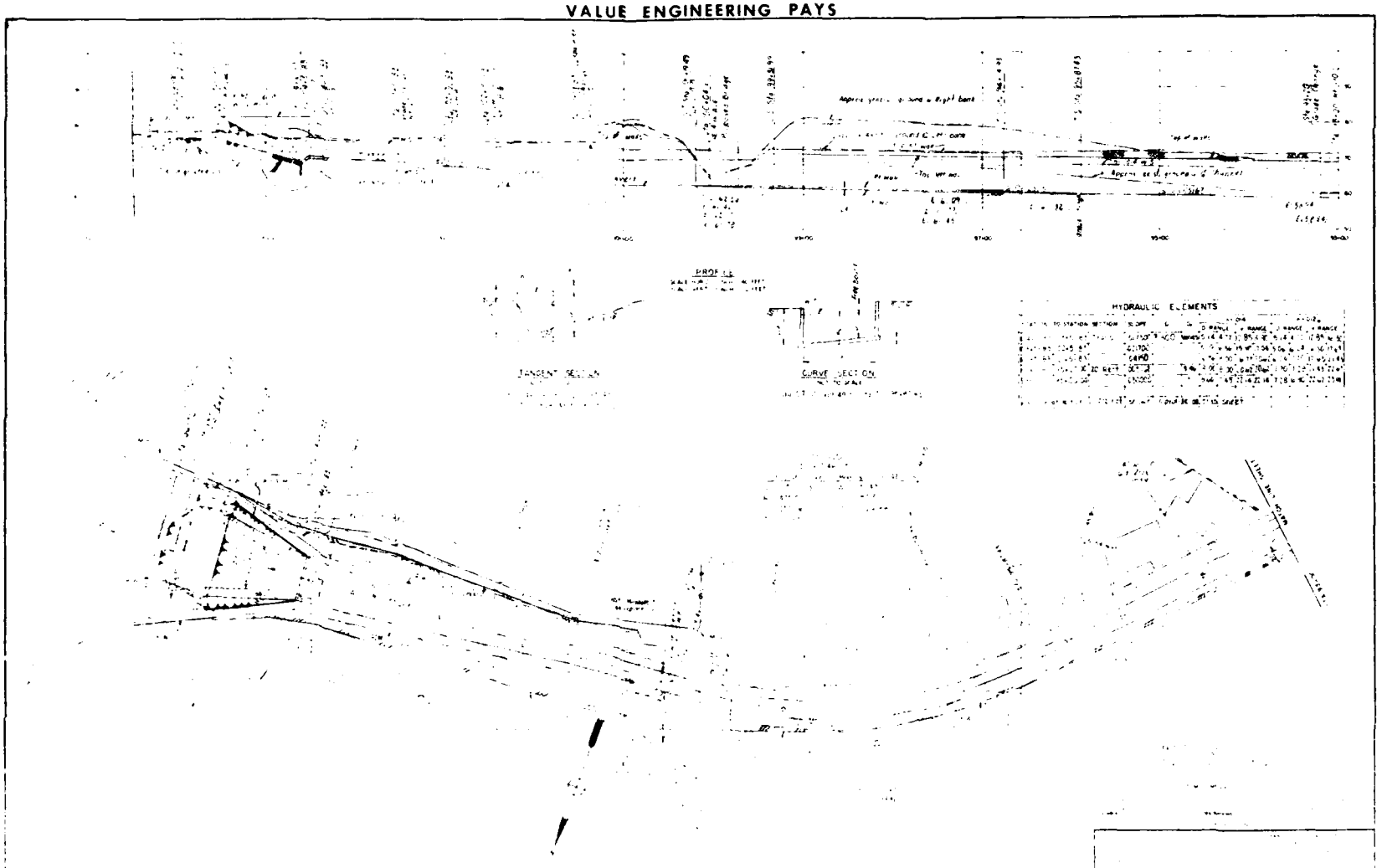
NOTES

1. See Plate [illegible] for Location of Test Holes, Pits and Borings
2. Test Pits were Excavated in September 1978
3. Test Boring (T.B.) were Excavated in February 1977, using an auger drilling
4. Test Borings (CTB) were Excavated in March 1968 by [illegible] using a Bucket drilling

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

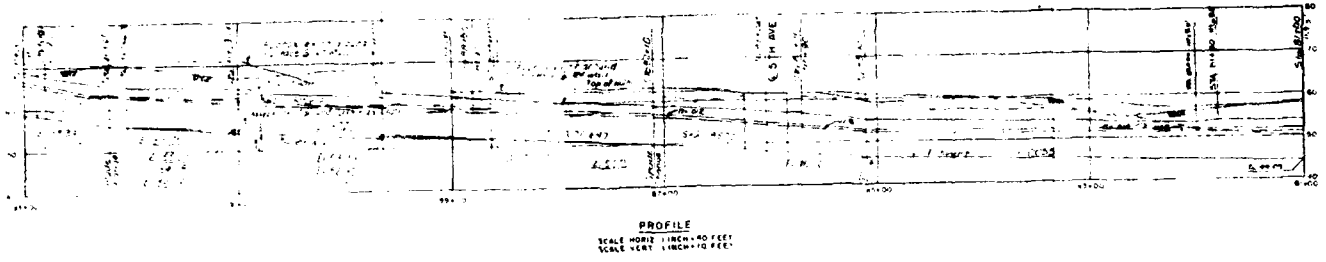
VALUE ENGINEERING PAYS



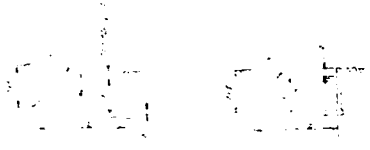
SAFETY PAYS

REPRODUCED AT GOVERNMENT EXPENSE

VALUE ENGINEERING PAYS

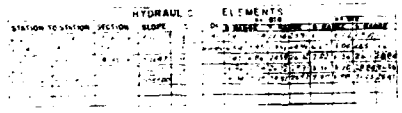


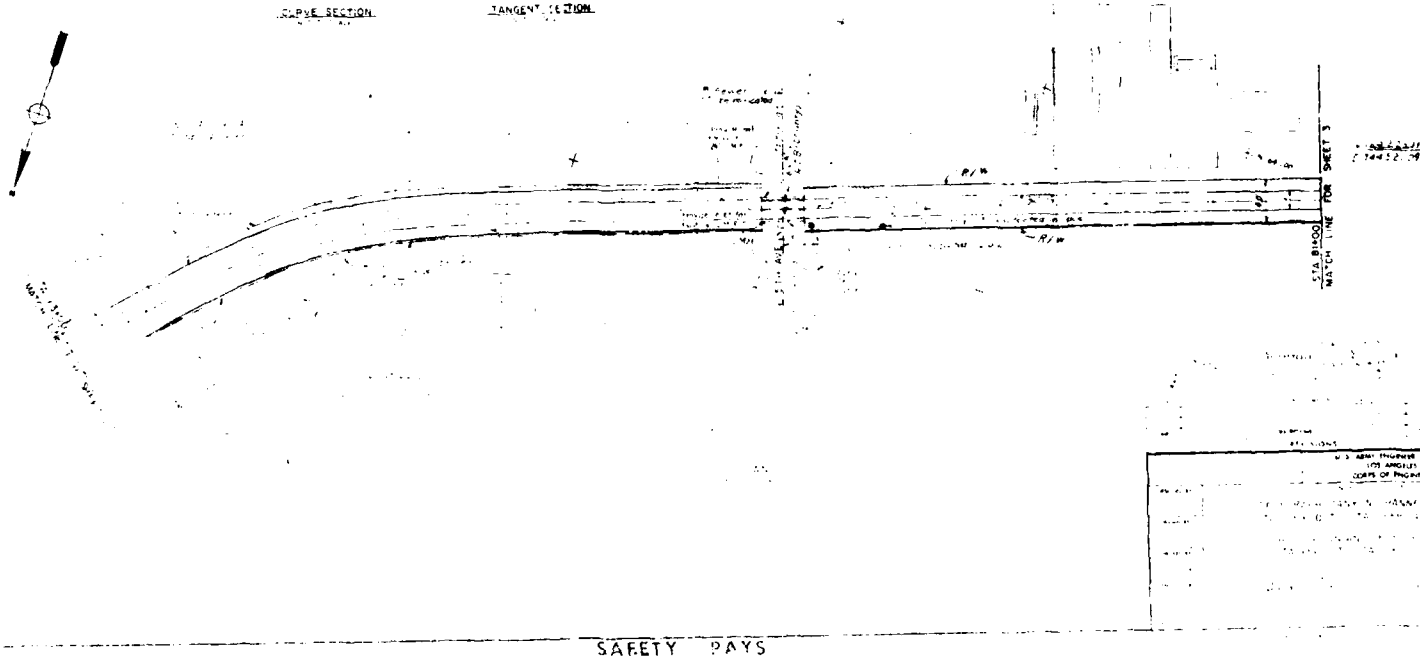
PROFILE



CURVE SECTION

TANGENT SECTION

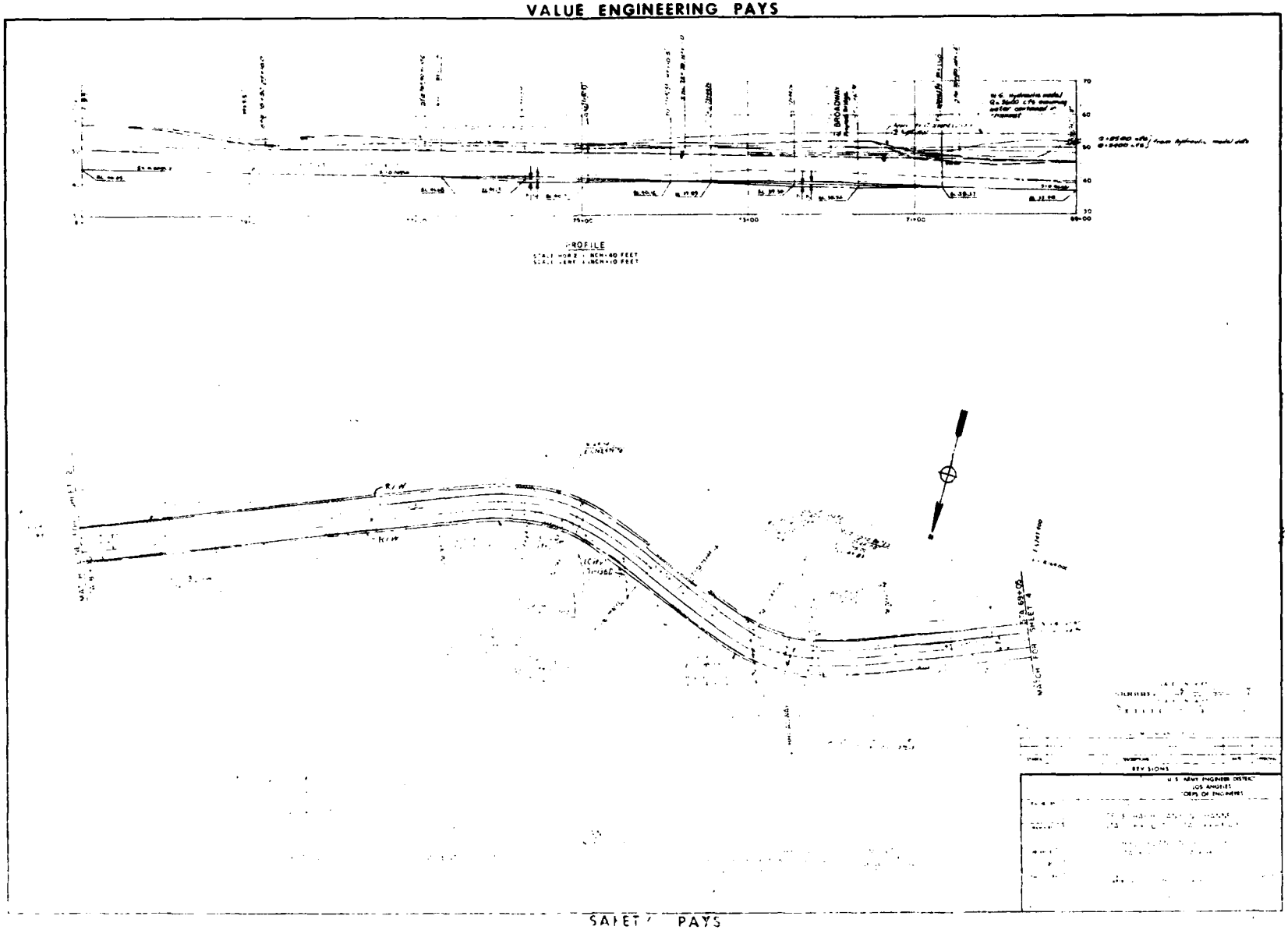




SAFETY PAYS

PROPERTY OF U.S. GOVERNMENT EXPENSE

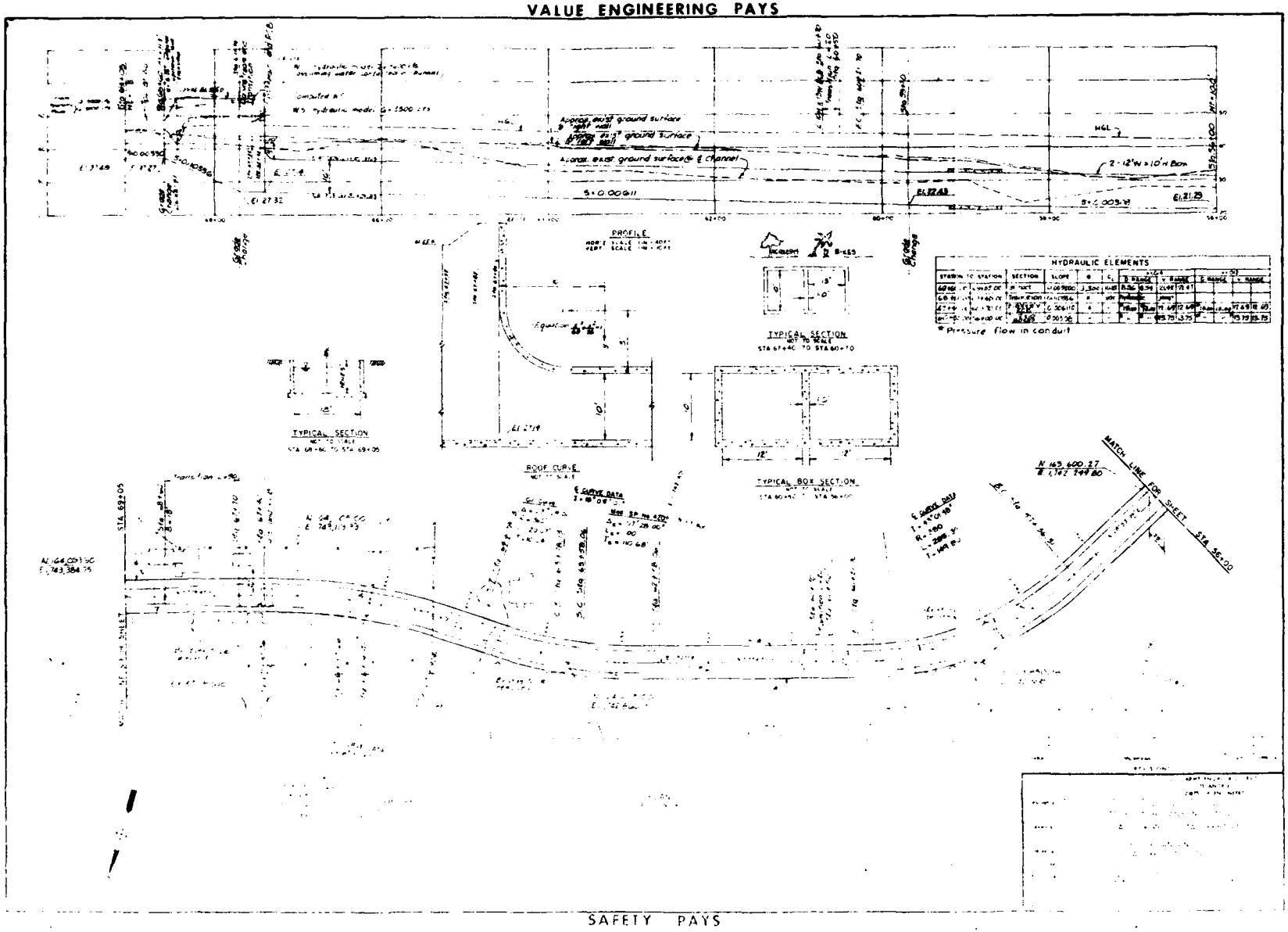
VALUE ENGINEERING PAYS



REPRODUCED AT GOVERNMENT EXPENSE

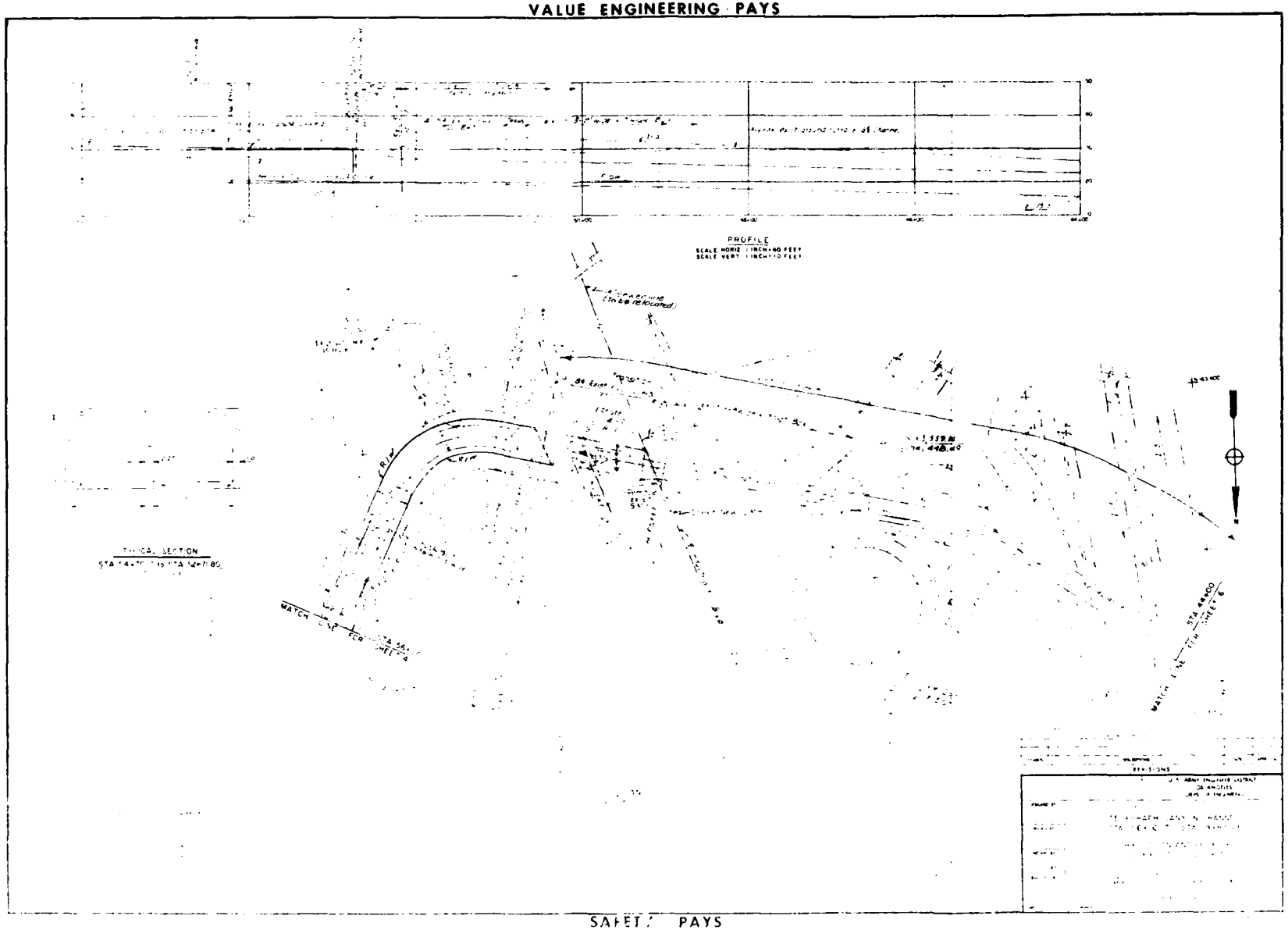
SAFETY PAYS

VALUE ENGINEERING PAYS



SAFETY PAYS

VALUE ENGINEERING PAYS



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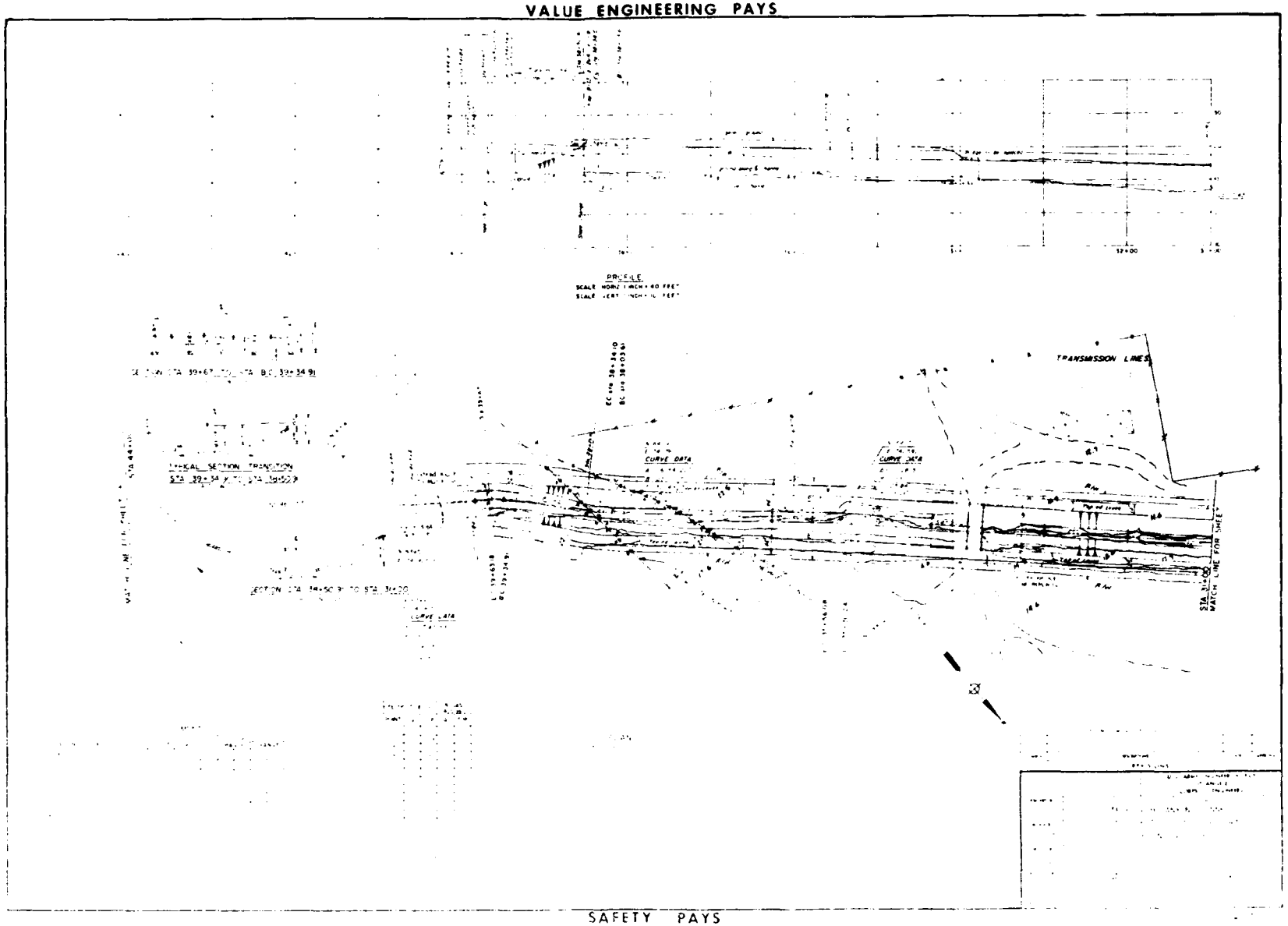

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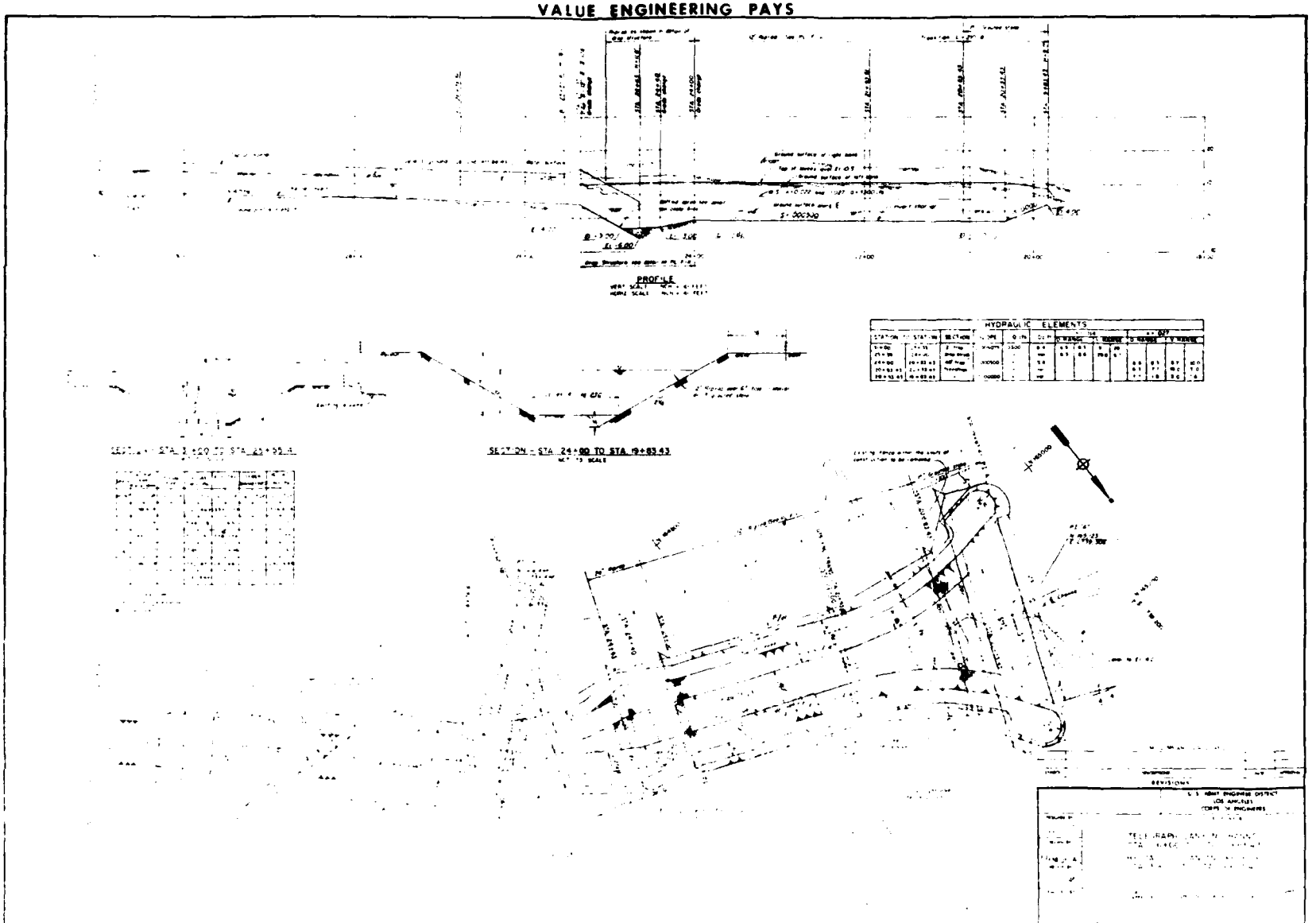

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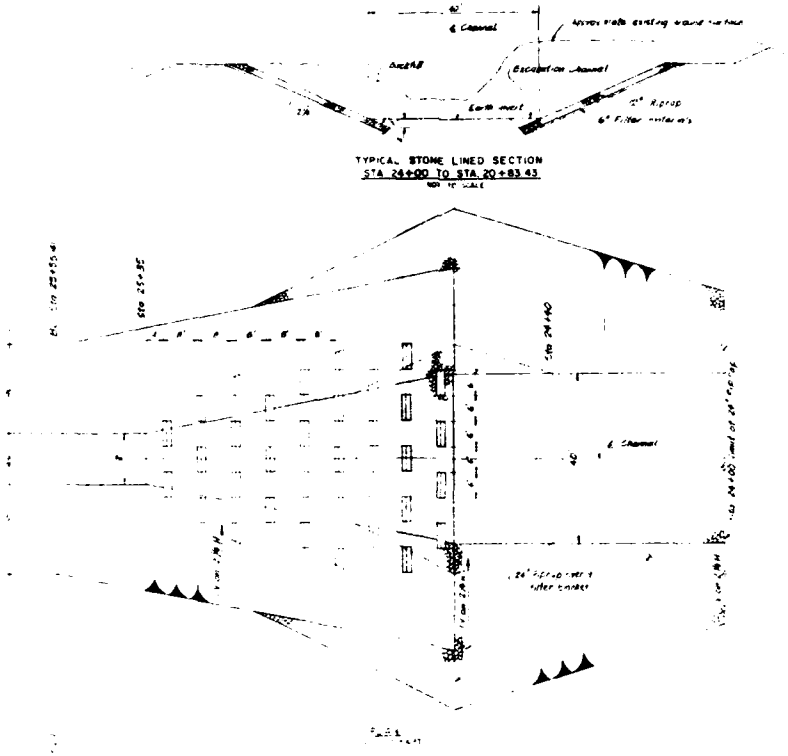

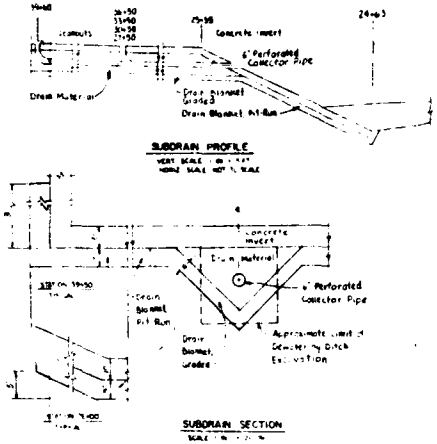

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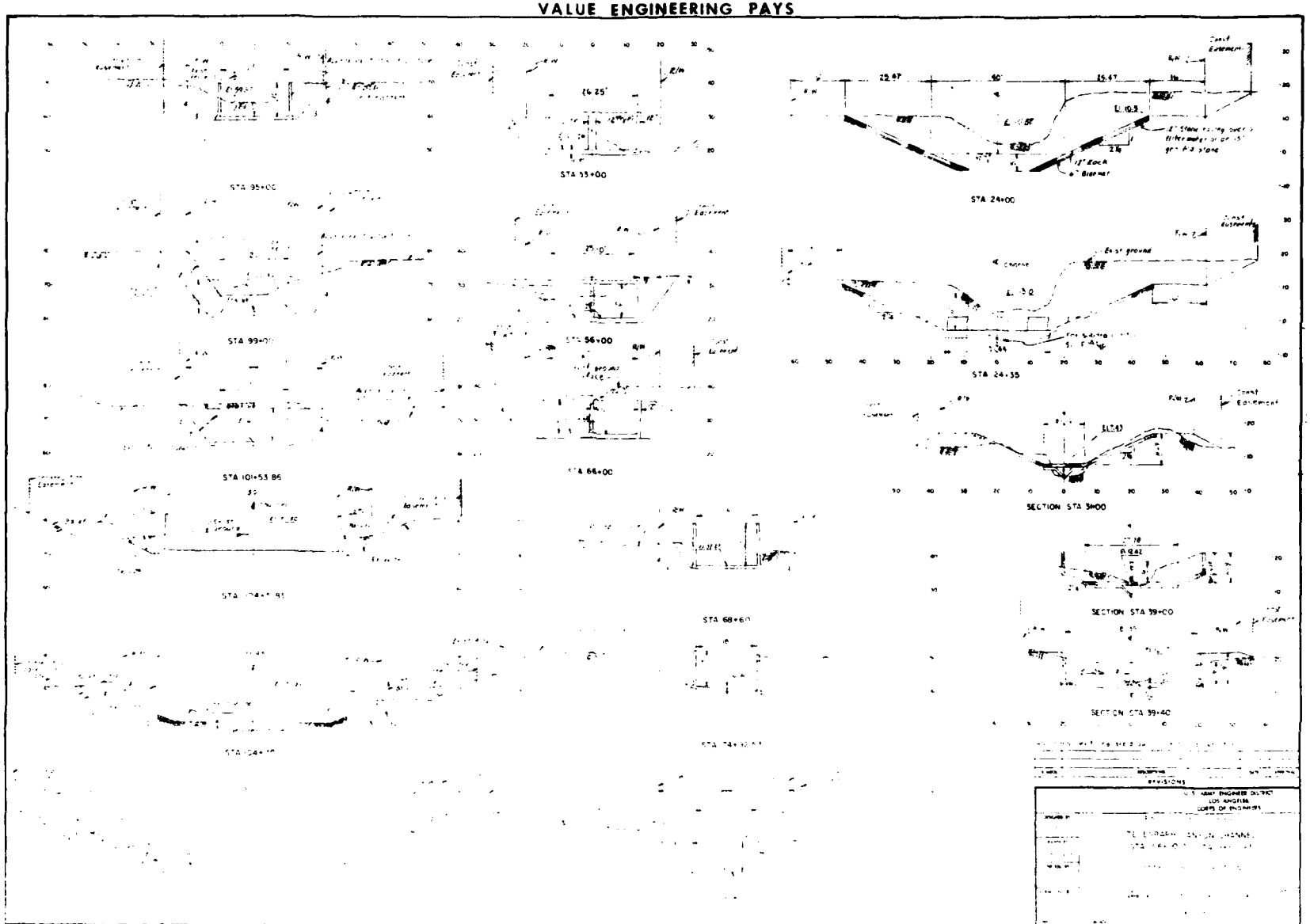

SAFETY PAYS

APPENDIX G

RECREATION AND BEAUTIFICATION

APPENDIX G

RECREATION AND BEAUTIFICATION

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RECREATION

It is not feasible to construct recreation facilities along Telegraph Canyon Creek. Previous plans explored construction of a bicycle trail along the planned channel with a rest stop at the east end of the project. Current policy concerning purchase of land for recreation purposes prohibits construction of the rest stop as previously proposed. The remaining bicycle path could be no longer than 1 mile, the length of the project above the freeway. A continuous path constructed for this distance would provide only 5 or 6 minutes of bicycling. Several additional negative aspects make this proposed recreation project highly questionable:

a. Only limited access is possible at the beginning of the project between 4th and 3rd Avenues. Access would be from 4th Avenue or additional land would have to be purchased to provide access from 3rd Avenue.

b. There are insufficient rights-of-way for both underpasses and street access unless recreational bridges were added at each crossing. (The City of Chula Vista Public Works Department is opposed to at-grade crossings because of the inherent danger involved in crossing these heavily traveled streets and because additional user-operated stop signals would disrupt the city's timed signal system.)

c. The western access to the trail is cut off by the San Diego and Arizona Eastern Railroad line. The possibility of any kind of at-grade crossing easement being granted by the railroad is very doubtful. Approval of the California Public Utilities Commission is also required.

d. Local officials and residents are very concerned about allowing easier access to backyards for burglars and vandals. Providing a trail would increase the potential for problems. Fencing to eliminate this problem in the event a trail were constructed would be expensive and might not be adequate.

e. The requirement of three recreational underpasses would make the project expensive.

f. Any connection to Cal Trans' proposed Bay Loop Bike Trail would be via a quarter-mile of heavily traveled primary road.

g. Esthetically, the trail would be of little interest. It would pass mostly behind homes and through an industrial area.

For the above reasons, project usefulness is extremely questionable. Cost would be high and benefits negligible.

BEAUTIFICATION

Introduction

The following section describes the design for esthetic treatment along Telegraph Canyon Creek. It presents the criteria used in selecting the esthetic treatment plan based upon the engineering requirements and right-of-way limitations of the flood control project, and upon environmental considerations. This plan will continue to be coordinated with the City of Chula Vista and the County of San Diego. The enhancement program would provide the optimum feasible appearance of the flood control project structures at critical points along the channel. In general, visibility of the creek is very limited; through most of its length it runs behind the fences of existing development and through industrial areas. Right-of-way considerations also limit available space for landscaping and access for maintenance. Esthetic treatment has been proposed only for those areas where the flood control features are highly visible, space is available for landscaping, and access exists for maintenance. Treatment would occur on lands acquired for the flood control purpose and would be developed as an integral part of the flood control project design.

Landscaping would blend in with the existing environment and reduce the visual impact of the channel. There are only two areas along the proposed project where esthetic treatment is recommended - at 4th Avenue and 5th Avenue. A total length of approximately 1,600 feet (14,300 sq. ft.) would be landscaped. Landscaping would consist of ground cover, large shrubs, and small trees, and would be irrigated. Cost of the overall treatment plan would be about $40,000. (See table G-1 for detailed costs.) The proposed esthetic treatment plan is necessary to provide an esthetically acceptable appearance of the flood control structure for nearby residences and public use facilities. Plate G-1 shows the treatement plan.

Environmental Setting and Engineering Requirements

At the upstream end of the channel, flood control features of the project begin between 3rd and 4th Avenues. In this area the right-of-way is relatively wide and highly visible. For a length of approximately 770 feet, the north side of the channel borders a playing field. There would be 15 feet between the channel wall and the edge of the right-of-way, allowing landscaping to screen the project from the field. The south side borders the back of apartments. From 4th Avenue almost to 5th Avenue, the channel runs behind the backyards of residential developments. Existing fences limit visibility. No access is available for required maintenance of landscaping. At 5th Avenue, existing development is so arranged that visibility is increased and access for maintenance of landscaping is available. A private drive parallels the channel for 400 feet along the north side of the channel just east of 5th Avenue. This drive provides access to four homes which front on it and increases visibility of the channel. Just west of 5th

Avenue a church and accompanying parking lot border the channel's north side for 440 feet. The south side of the channel is bordered by the back side of an apartment and by heavy commercial use (automotive repair). West of the above-described area, the channel flows through areas of mixed residential, commercial, and industrial uses until it reaches Interstate 5. Visibility is low and right-of-way available for landscaping is very limited or nonexistent. West of the freeway, the channel flows through a generating plant owned by San Diego Gas and Electric Company. Landscape plantings along the channel would meet engineering requirements specified in EM 1110-2-301, "Landscape Planting at Floodwalls, Levees and Embankment Dams," dated 29 December 1972. These requirements specify a minimum root-free zone of 3 feet from the channel.

Local Coordination

The project esthetic treatment concepts described in this report will be coordinated with the County of San Diego and the City of Chula Vista. Coordination on and local agency concurrence with the plan will be completed during review of this draft report. Operation, maintenance, and replacement would be a local responsibility.

Esthetic Treatment Features

Because of the restrictions set forth in the above paragraphs, landscaping would be restricted to the area east of 4th Avenue where the channel borders the playing fields,and to the north side of the channel on both sides of 5th Avenue where the channel borders the private drive and the church. East of 4th Avenue, an area 770 feet long and 15 feet wide would be landscaped on the north side of the channel in order to screen from the play field. At 5th Avenue a strip of landscaping 9 feet wide would extend for 400 feet north and 440 feet south of the street. This would screen the channel from homes and a church. Benefits from this landscaping would include improved appearance of the channel and reduced dust and erosion. Planting would be simple, functional, and economical to maintain. Plants would be selected for their capability for vigorous and healthy growth and their ability to enrich and augment the existing landscape. Those with fibrous root systems would be planted about 3 feet away from channel walls so the root structures would not intrude into the necessary root-free zone. Most of the plant material used would consist of native plant species; species that have adapted to the region would also be used. Native type plants to be used for the 15-foot-wide landscape area (at 4th Avenue) include: toyon, sugar bush, acacia species, emory baccaria and salt bush. These species would have minimum maintenance requirements because they are capable of survival under local climatic conditions without periodic watering. One gallon plant material would be used because of availability. Shrubs and trees would be planted in clusters or groups for spatial definition and visual screening. An average of about one shrub or tree would be planted per 95 square feet of irrigated landscaped area. Vines would be planted along fences approximately every 20 feet. Hardy fast growing iceplant would be planted in the irrigated landscape. All of the

landscaped areas would be irrigated. The irrigation system would be located on the outer side of the channel wall. Stream spray type sprinklers would be used because of their low precipitation rate. Automatic station controllers and remote control values would be used for the irrigation system. Irrigation water for the project would be provided by the Sweetwater Authority. An existing 6-inch-diameter cast iron service line along 5th Avenue with 60 pounds of pressure would provide irrigation water for the 5th Avenue landscape area. Along 4th Avenue, an existing 8-inch-diameter cast iron service line with 60 pounds of pressure would provide irrigation water for the 4th Avenue landscape area. A reduced pressure back flow prevention device would be required by the Sweetwater Authority to prevent contamination of potable water lines.

TELEGRAPH CANYON CREEK
Recommended Plant List

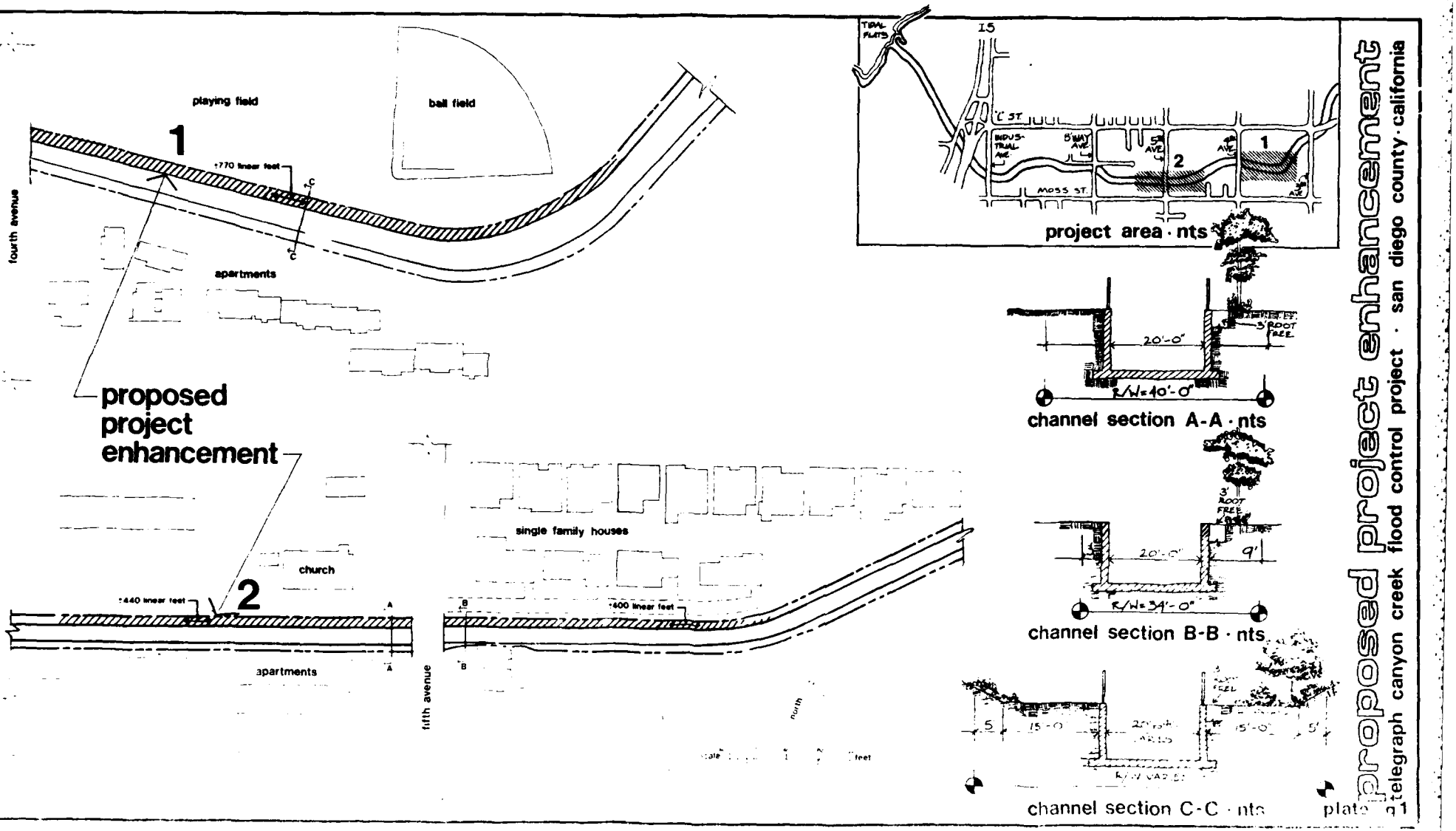
A. Shrubs/Trees	
Toyon	Heteromeles arbutifolia
Bushy Yate	Eucalyptus lehmanni
Acacia	Acacia latifolia
Sugar Bush	Rhus ovata
B. Ground Cover	
Rosea ice plant	Drosanthemum hispidium
Dwarf coyote bush	Baccharis pilularis
Salt Bush	Atriplex semibaccata

TABLE G-1

ESTIMATED COST

Proposed Project Enhancement - Telegraph Canyon Creek

Description	Unit	Quantity	Unit Price	Total
Project enhancement				
Landscaping				
a. Trees, 15 gal.	ea.	65	$75.00	$ 4,875
b. Shrubs, 5 gal.	ea.	87	25.00	2,175
c. Vines, 5 gal.	ea.	76	25.00	1,900
d. Ground cover, 12" o.c.	flat	180	25.00	4,500
e. Rough/fine grading	SF	19,110	.06	1,147
f. Soil preparation	SF	19,110	.10	1,911
Irrigation system				
a. Mains, 2" I.P.S. Sch. 40-P.V.C.	L.F.	900	4.00	3,600
b. Water meters, 1-1/2"	ea.	2	750.00	1,500
c. Six station controllers	ea.	2	250.00	500
d. #14 d.b. wiring	L.F.	4,400	.14	616
e. Hose bibbs	ea.	17	50.00	850
f. Automatic electric valves 1-1/2"	ea.	9	90.00	810
g. Shrub heads	ea.	167	25.00	4,175
h. Pressure-type backflow preventor	ea.	2	350.00	700
				29,259
Contingencies			(15%)	4,389
Subtotal				$33,648
Engineering and design			(.10)	3,365
Supervision and administration			(.06)	2,019
TOTAL, Project enhancement				$39,032
				Say $40,000



proposed project enhancement

guajome

telegraph canyon creek flood control project · san diego county · california

plate 21

APPENDIX H

FISH AND WILDLIFE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
24000 Avila Road
Laguna Niguel, CA 92677

March 23, 1982

Commander
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Re: Planning Aid Letter for Telegraph Canyon Creek
Flood Control Project, Chula Vista, San Diego County,
California

Dear Colonel Taylor:

This is a planning aid letter of the U.S. Fish and Wildlife Service (FWS) on the Telegraph Canyon Creek Flood Control Project in San Diego County, California. This document was prepared in accordance with the Fiscal Year 1982 Scope of Work agreed to by our agencies and it is being provided for equal consideration of fish and wildlife conservation in the planning of this project. Findings herein are based on project information provided by project manager, Peter Glyer, on February 8 and March 2, 1982. Biological data are based on a review of our project files and a 1/2 day field investigation on February 8, 1982. This document is of a planning aid nature and does not constitute the report of the Secretary of the Interior on the project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act (FWCA), P.L. 91-190.

PROJECT DESCRIPTION AND HISTORY

Because of potential danger to development along the Telegraph Canyon Creek, the City of Chula Vista and the County of San Diego have requested the Corps of Engineers (CE) to study the situation and design a project to control flood damage along Telegraph Canyon Creek. A number of alternative plans were considered and a preferred plan (Plan M) was selected. This plan consisted of a concrete channel from a point 400 feet upstream of 4th Avenue to Interstate 5 and an earth-bottom channel from Interstate 5 to San Diego Bay. Subsequent to the selection of the preferred plan, your agency consulted with the FWS, in accordance with Section 7 of the Endangered Species Act, to examine the impacts of the preferred plan on threatened and endangered species. The consultation concluded that provided several conditions (which will be restated in this letter) were met,

the project would not jeopardize the continued existence of the California least tern (Sterna albifrons browni) and light-footed clapper rail (Rallus longirostris levipes). We also provided your agency a planning aid letter (May 14, 1979) which more fully described the species occupying the project area, reiterated the need to prohibit disturbance to endangered species, and suggested measures which could be taken to minimize adverse impacts to wildlife resources in the project area.

It is our understanding that the preferred plan has been further modified to extend the concrete lined section of channel 1,500 feet downstream from Interstate 5, to locate an energy dissipator at the terminal end of the concrete channel, and to line the channel sides and bottom with 24 inch stone facing from approximately station 24+65 to station 24+00. This modification hereafter referred to as the "modified plan," has been proposed to effect a cost savings in reducing the land area needed for the project and to eliminate the need to relocate a high pressure gas main and several utility lines which cross the creek between stations 26+00 and 26+25. This planning aid letter is being provided to address the impacts upon fish and wildlife resources of the proposed changes to the preferred flood control plan.

EXISTING CONDITIONS

From Interstate 5 to its mouth at San Diego Bay, Telegraph Canyon Creek has been channelized into essentially a steep sided drainage way (Figure 1). The channel averages about 15 feet in width, with the bottom composed mainly of fine material, sand, silts, and clays. The lower 600 feet of the creek is within the intertidal range and receives regular tidal flushing. A sparse stand of pickleweed (Salicornia virginica) and a moderate stand of cattails grow at the water's edge. It appears a common maintenance practice to remove the cattails whenever flow in the channel would be impeded.

The fisheries values of this lower portion of the stream are expected to be moderate and would most likely consist of forage fish species and some juvenile sportfish. The most abundant food resource appears to be aquatic invertebrates. Although no fish sampling was undertaken for this report, the following common species may be expected: topsmelt (Atherinops affinis), arrow goby (Clevelandia ios), longjaw mudsucker (Gillichthys mirabilis),California killifish (Fundulus parvipinnis), and mosquitofish (Gambusia affinis).

Bird use of the lower portion of the creek may be somewhat limited by the narrow channel width, steep high banks, and lack of vegetative cover. However, this portion of the channel is close to the "J" Street Marsh which supports thousands of wintering shorebirds, waterfowl, and other water-associated birds. Thus, a number of birds using the marsh may also forage in the creek. Wading birds such as snowy egret (Egretta thula), common egret (Casmerodius albus), and great blue heron (Ardea herodias), and smaller shorebirds probably use this area since the shallow quiet waters would provide an excellent habitat for catching fish and aquatic invertebrates.

Figure 1. Lower, intertidal portion of Telegraph Canyon Creek looking toward San Diego Bay.

The upper 1,300 feet of creek between the bay and Interstate 5 is above tidal influence. This area is dry during most of the year except during and following periods of rainfall (Figure 2). Its steep slopes are vegetated with grasses and ruderal vegetation and its bed is largely a barren mixture of cobbles and sand interspersed with a few ruderals.

Because of its normally dry condition, it supports no aquatic resources. This area is probably used by sparrows, house finches (Carpodacus mexicanus), mourning doves (Zenaida macroura), and other birds which feed upon plant seeds and may pick up gravel from the creek bed. Its grassy banks apparently provide a food resource for a small mammal population as indicated by rodent burrows observed along the channel banks. The reptile population is expected to be typical of a disturbed site in coastal southern California. Few species are expected and those present would be generalists in their food habits and tolerant of disturbance in their habitat requirements. The side-blotched lizard (Uta stansburiana) is probably the most common reptile in the project area.

FUTURE WITHOUT THE PROJECT

Should the project not be constructed, no significant changes in the fish and wildlife resources of the project area are expected. The area surrounding this portion of the creek has been developed as an electric power generation facility by the San Diego Gas and Electric Company. It appears that the land use will remain the same for the foreseeable future and no significant changes in the creek are anticipated.

FUTURE WITH THE PROJECT

The major impacts of the project on the fish and wildlife resources of Telegraph Canyon Creek between Interstate 5 and San Diego Bay under the preferred plan (Plan M) and modified plan are presented in Table 1. The modified plan would increase the area subject to tidal inundation almost fourfold over existing conditions. This would be accomplished by nearly doubling the current channel width and by reducing the slope of the channel banks. Also, the creek would be deepened by nearly 4 feet over a distance of about 500 feet which would improve conditions for aquatic resources.

The preferred plan would increase the area of tidal inundation by almost 10 times the current area. This would be accomplished by widening the creek channel to nearly twice its present size and lowering the creek bed from 4 to 12 feet to allow tidal flows to extend almost up to Interstate 5. This would greatly expand the existing aquatic habitat in the creek and would lead to a considerable increase in the current fish population of the creek. There would also be a large increase in the utilization of the creek by water-associated birds. It was mentioned earlier that the current narrow channel width and high steep banks may limit bird use of the channel. The increased channel width and more gradually sloping banks, coupled with the increased tidal area and increased food supply,

Figure 2. Upper non-tidal portion of Telegraph Canyon Creek looking toward Interstate 5 (in background).

TABLE 1. TELEGRAPH CANYON CREEK FLOOD CONTROL PROJECT IMPACTS

	No Project	Preferred Plan (Plan M)	Modified Plan
Area of Tidal Inundation (ft^2)	13,800	134,000	53,200
Linear Distance of Tidal Inundation (ft)	600	1,900	600
Substrate Characteristics within Area of Tidal Inundation (ft^2/(%))			
Soft bottom	10,400 / 100	68,700 / 75	14,000 / 33
Rock bottom	—	7,400 / 5	1,000 / 5
Concrete bottom	—	17,800 / 20	25,800 / 62
Soft sides	3,400 / 100	28,200 / 65	—
Rock sides	—	15,400 / 35	11,000 / 96
Concrete sides	—	—	400 / 4
Vegetation along channel	No change	Increased	Eliminated
Expected bird use	No change	Greatly increased	Increased
Fishery values	No change	Greatly increased	Increased
Mammal population	No change	Slightly increased	Decreased
Herptiles	No change	Slightly increased	Slightly increased

should cause a great increase in the number of bird species and individuals which would feed within the channel. This increased utilization would occur under both the modified and preferred plans, but to a greater degree under the preferred plan since a much larger area would be brought within tidal range.

The preferred plan benefits fish and wildlife in another way over the modified plan in that a large majority of the area subject to tidal inundation is composed of soft substrate whereas under the modified plan most of the substrate is hard. It is our belief that in southern California wetlands, rivers, and estuaries, soft substrates support a greater biological productivity than hard substrates. One distinct advantage of soft substrate over hard substrate in the intertidal range is that it provides a moist sheltered area. For example, as the tide retreats, aquatic invertebrates can burrow down into a soft substrate and remain moist, whereas on a hard substrate they would be subject to exposure and desiccation. Certainly, both soft substrate and hard substrate support their own characteristic assemblages of organisms. It is desirable to have substrate of both types for maximum species diversity. However, the preponderance of hard substrate in the modified plan would result in a reduced biological productivity as compared to the preferred plan.

The vegetation along the channel would be virtually eliminated under the modified plan, but should increase over current levels under the preferred plan. Under the modified plan, all slopes would be either concrete or riprap; neither of these types are conducive to supporting plant growth. The area of soft channel sides in the preferred plan should support a healthy growth of hydrophytes near the water's edge and could be managed to encourage a healthy stand of other native plants on the upper portions of the slopes.

The mammal and herptile populations would probably be less affected by the project than either the birds or aquatic resources. We would expect the small mammal population to increase slightly under the preferred plan and to decrease under the modified plan. The modified plan would result in a reduction in the channel bank vegetation and thus a reduction in the food supply for the small mammal population. The preferred plan could result in an increase in bank vegetation which, in turn, would provide an increased food supply for the small mammal population. Both plans could result in slightly improved herptile populations as the riprap used in bank stabilization may provide improved habitat conditions for snakes and lizards.

MITIGATION FEATURES

There have been a number of mitigation measures suggested and agreed to in the history of this project. Because a considerable time period has elapsed since these agreements were made, it is probably beneficial to restate these conditions as contained in past correspondence on the project.

1. A dragline (or other comparable construction equipment which would be least damaging to the marsh area) will be specified for work at the mouth of the creek.[1/]

2. All excavated spoil will be disposed of outside of the creek.[1/]

3. Construction specifications will require the contractor to control all pollutants (including sediment) to avoid pollution of stream flows entering the "J" Street Marsh.[1/]

4. The stabilizer to be located at the mouth of Telegraph Canyon Creek will be notched to provide adequate tidal exchange.[1/]

5. All work within the "influence zone" extending from the mouth of Telegraph Canyon Creek (defined as the + 5 feet msl contour) upstream a linear distance of 500 feet will be accomplished between September and March to avoid the nesting season for the light-footed clapper rail and the California least tern.[1/ 2/]

6. Planting of pickleweed and cordgrass in the newly created intertidal area subsequent to the completion of channel construction will be accomplished as a means to accelerate its establishment.[1/]

7. The proposed project would not disturb existing or other vegetative communities developing as a result of saltwater inundation by:

a) periodic maintenance activities;

b) accelerating the rate of scouring in the marsh during a 100 year flood, or by;

c) depositing abnormal sediment loads on the existing or newly created wetland habitats.[3/]

[1/] Letter dated 16 March 1979 from Colonel Gwynne A. Teague, District Engineer, Los Angeles District, U.S. Army Corps of Engineers, to Mr. R. Kahler Martinson, Regional Director, U.S. Fish and Wildlife Service.

[2/] Letter dated 24 May 1979 from William H. Meyer, Acting Regional Director, U.S. Fish and Wildlife Service, to Colonel Gwynne A. Teague, District Engineer, Los Angeles District, U.S. Army Corps of Engineers.

[3/] Letter dated 12 March 1980 from William H. Meyer, Acting Regional Director, U.S. Fish and Wildlife Service, to Colonel Gwynne A. Teague, District Engineer, Los Angeles District, U.S. Army Corps of Engineers.

8[4/] The project would not extend beyond the plus 4-foot contour (msl).[4/]

RECOMMENDATIONS

The FWS continues to be concerned about the progressive loss of biologically productive intertidal habitats in southern California. We rarely evaluate projects that offer opportunities to increase the amount of intertidal habitat. Therefore, we are encouraged that both the preferred plan and modified plan would increase this habitat type.

Based upon the information provided us on the preferred plan and modified plan, we have determined that the preferred plan offers considerably greater benefits to public fish and wildlife resources than the modified plan. The preferred plan would create approximately 2 acres more intertidal habitat than would the modified plan. In addition, we believe the soft substrate more prevalent in the preferred plan offers much greater biological value than the hard substrate more prevalent in the modified plan. For these reasons we substantially favor the preferred plan. We, therefore, request that the Corps adopt the preferred plan as its primary alternative in seeking funding for this project. Should either the modified plan or preferred plan be selected, we request that Corps of Engineers planning documents, including benefit/cost analyses, recognize the project benefits of increased intertidal habitat and its importance to public fish and wildlife values. Should the preferred plan be funded, we request that the unrevetted slopes be planted with native vegetation which will serve to deter erosion and provide a food source for area wildlife. We would be willing to provide you a list of plant species suitable for this purpose.

We believe that the modified plan would also result in an improvement over present conditions for fish and wildlife resources. We would, therefore, not actively oppose this alternative.

We were asked by the project manager to propose a recommended size for the notches in the stabilizer structure at the creek mouth. While the specifics regarding this problem may be somewhat beyond the realm of our expertise, we feel that the notches should be deep enough and wide enough to allow a high volume daily tidal exchange and to prevent a situation where stagnant water would be ponded behind the stabilizer structure. It

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[4/] Letter dated 9 October 1979 from Colonel Gwynne A. Teague, District Engineer, Los Angeles District, U.S. Army Corps of Engineers, to Mr. R. Kahler Martinson, Regional Director, U.S. Fish and Wildlife Service.

would appear that two notches, each 10 feet across to a depth of -1 foot msl, should provide an adequate capacity for tidal exchange. This is simply an estimate of current conditions and should be evaluated in light of the need to prevent scouring of the "J" Street Marsh under flood flow conditions.

At this point, we would also recommend the use of ungrouted rock as the material of choice in constructing the stabilizer structure at the creek mouth. The use of large rock at the creek mouth would allow tidal flows to pass through the stabilizer structure and would reduce the size of the notches in the stabilizer needed to allow tidal exchange. One area where this principle has functioned effectively is at the entrance to Mission Bay. The large rock breakwater which separates the San Diego River Flood Control Channel from the Mission Bay entrance channel is quite porous and permits tidal water to enter and leave the flood control channel. Without this tidal interchange, we are convinced that the water quality in the flood control channel would quickly deteriorate.

One final suggestion is that if fill material is needed for the project, it be taken from the area north and south of the creek mouth, west of the San Diego Gas and Electric Company fence and above the plus 5-foot contour line. This area could be lowered several feet to increase the intertidal area of the "J" Street Marsh which would be an additional feature for improving public fish and wildlife resources.

Sincerely yours,

Dale A. Pierce
for

Ralph C. Pisapia
Field Supervisor

cc: CDFG, Reg. 5, Long Beach, CA

AD-A150 164 TELEGRAPH CANYON CREEK CITY OF CHULA VISTA SAN DIEGO COUNTY CALIFORNIA DE.. (U) ARMY ENGINEER DISTRICT LOS ANGELES CA JUL 83 3/3

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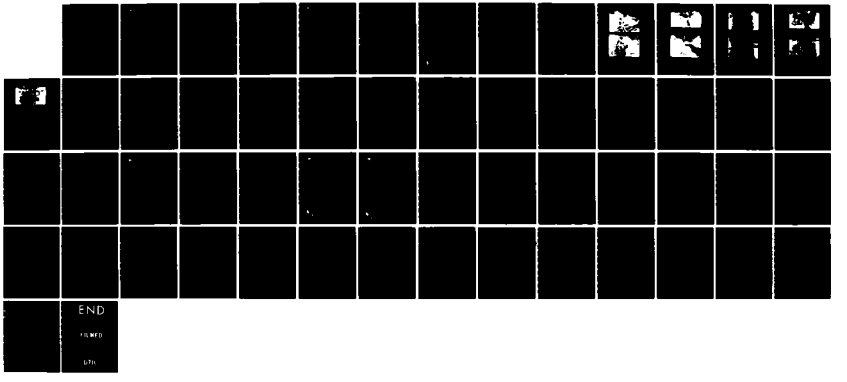

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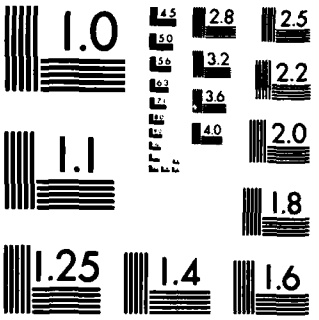


United States Department of the Interior

FISH AND WILDLIFE SERVICE

Lloyd 500 Bldg., Suite 1692
500 N.E. Multnomah Street
Portland, OR 97232

March 12, 1980

District Engineer
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Sir:

This regards the Corps of Engineers project at Telegraph Canyon Creek in San Diego County, California. By letter dated December 18, 1979, the Department of the Interior submitted comments on the Draft Detailed Project Report (DPR) and Draft Environmental Impact Statement (DEIS)for said project. That letter reflected, among other things, issues of concern to the Fish and Wildlife Service (Service).

Subsequent to that letter, personnel from the Los Angeles District, Corps of Engineers and our Laguna Niguel Field Office met on January 10, 1980 to discuss various aspects of the project proposed between Interstate Highway 5 and San Diego Bay. The following points were clarified for us by Corps staff concerning the potential impacts on the California least tern and light-footed clapper rail.

1. The proposed project would not disturb existing or other vegetative communities developing as a result of saltwater inundation by:

a) periodic maintenance activities;

b) accelerating the rate of scouring in the marsh during a 100 year flood or by;

c) depositing abnormal sediment loads on the existing or newly created wetland habitats.

We appreciate the Corps' most recent effort to clarify the issues raised in the DPR and DEIS. Assuming a-c are realized, we do not believe further consultation will be necessary regarding the endangered species,

as indicated in the December 18, 1979 letter. However, we continue to suggest that the FEIS should:

1. Clearly and succinctly reflect the Corps intent to implement a-c by either:

a) incorporating a-c into the text of the FEIS after correcting existing disparities in the DEIS, or as a minimum;

b) footnote each page requiring clarification so that the reader may easily locate the required clarification information.

2. Modify or delete the sections in the text of the DEIS referring to previous Service comments.

3. Expand the section entitled "Adverse Environmental Effects Which Cannot Be Avoided" to include the adverse environmental effects concerning wildlife resources over the entire project alignment.

4. Develop a section which clearly details proposed wildlife mitigation measures to be implemented to offset each of the adverse impacts associated with the project proposed, and indicate an approximate time frame for their implementation.

Finally, and as stated in the December 18, 1979 letter, we do not believe the project proposed meets the intent of Executive Order 11988 on floodplain management. We are hopeful that current and future projects will endeavor to encourage effective zoning ordinances which are within the primary intent of the Executive Order concerning proper floodplain management. By encouraging participation in restrictive zoning ordinances within the historic floodplain (particularly in low density or nondeveloped areas) as a minimum the following benefits may be realized:

1. Costly structural alternatives may be averted;

2. Structural alternatives which encourage accelerated floodplain development and greatly increase the flood hazards to public safety could also be averted;

3. Many of the adverse environmental impacts normally associated with structural alternatives could be averted.

In existing developed areas of the floodplain, the above benefits may be realized by encouraging flood proofing for existing structures. Implementation of the above measures is clearly the intent of the Executive Order. While a structural alternative may sometimes still be the only effective flood protection method, it is recognized that flood prevention measures (through restrictive zoning) and modified flood proofing measures

for existing developed areas normally provide a more beneficial solution to flood control problems.

We appreciate having had the opportunity to meet with your staff to resolve several of the issues raised in the comments on the DPR and DEIS. We look foward to working with your office on future projects.

Sincerely yours,

Bill Meyer

Acting Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

May 24, 1979

In reply refer to:
AFA-SE, #1-1-78-F-95

Colonel Gwynn A. Teague
District Engineer
Department of the Army
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Colonel Teague:

Reference is made to your letter of March 16, 1979, regarding our Biological Opinion issued January 25, 1979, on the proposed Telegraph Canyon Creek Project. We are pleased that you can accommodate our conditions and most of the enhancement recommendations. However, as addressed in your letter, several points need to be clarified.

We agree that channel construction between September and March to avoid disturbance to the light-footed clapper rail and California least tern is primarily appropriate to the channel reach downstream of Interstate 5. Further, we agree with your suggestion that a 500-foot "influence zone" can and should be established to allow flexibility in construction and protection for endangered species.

By this letter we are amending recommendation #1 of our Biological Opinion of January 25, 1979, on the project to read:

> "1. All work within the 'influence zone' extending from the mouth of Telegraph Canyon Creek (defined as the +5 feet msl contour) upstream a linear distance of five hundred feet (500') will be accomplished between September and March to avoid the nesting season for both species;"

We believe that 500 feet is the absolute minimum distance required to guard against secondary impacts to the birds.

We are interpreting your letter of March 16, 1979, as official concurrence with this stipulation.

Your efforts at coordinating on this project and planning affirmative action to benefit endangered species are appreciated. With the continued cooperation of Federal development agencies such as the Corps of Engineers, the tern and clapper rail will eventually recover and be delisted.

Thank you for the opportunity to comment on this matter. We are available for future assistance related to the project if the need arises.

Sincerely yours,

Bill Meyer

William H. Meyer
Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
24000 Avila Road
Laguna Hills, CA 92677

May 14, 1979

Colonel Gwynn A. Teague
District Engineer
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053

Re: Planning Aid Letter for Telegraph Canyon Creek,
San Diego County, California

Dear Colonel Teague:

This letter is a planning aid supplement to the original (March 4, 1976) Fish and Wildlife Service (FWS) report on the U.S. Army Corps of Engineers' proposed Telegraph Canyon Creek Project, San Diego County, California. This supplemental report reflects FWS views on the modified flood control project. This report is only of a planning aid nature and does not constitute a FWS report on the project within the meaning of Section 2b of the Fish and Wildlife Coordination Act (48 Stat. 401 as amended; 16 U.S.C. 661 et. seq.). However, this report is intended to fulfill our input into the feasibility investigation by the U.S. Army Corps of Engineers (CE) on the proposed project.

In reviewing our original report, we have determined the need to include further information concerning the flora and fauna which utilize various habitats within the proposed project area.

Our primary concern in this regard is with project induced impacts on public fish and wildlife resources, particularly to endangered species. Our letter dated 25 January 1979 addressed the proposed project's effects on endangered species and made specific recommendations to promote conservation of the California least tern and the light-footed clapper rail.

Concerning the other species which utilize the project area, we anticipate no significant adverse impacts provided the following conditions are implemented:

1. Conditions 1-5 in our January letter are carried out.

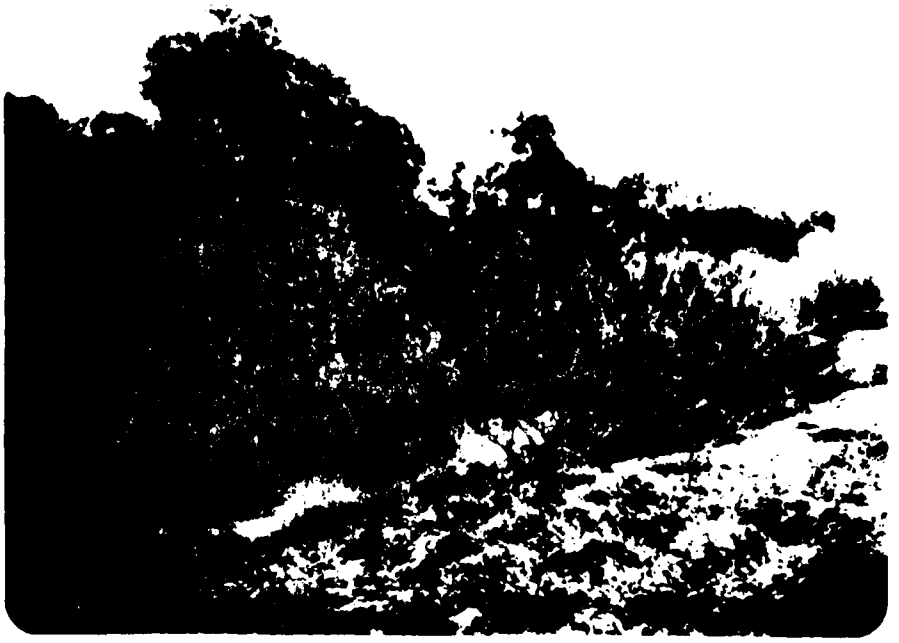
2. A corridor of native or naturalized vegetation will be

established from 4th Avenue to Highway 5 (refer to species checked in red).

3. The proposed project will be completed as detailed by CE personnel at our two coordination meetings in the fall of 1978 and summarized in the Fish and Wildlife Service Biological Opinion dated 25 January 1978.

If the above conditions are implemented, we anticipate long term positive impacts to fish and wildlife resources, particularly between the existing J Street marsh and several hundred feet upstream.

The following is a pictorial representation of Telegraph Creek beginning at Third Avenue and terminating at I-5.



Photographs 1 and 2:

This area is located immediately downstream of Third Avenue. The extensive use of native vegetation, such as willows and cottonwoods, or the intermixture of native trees and introduced species, as found in this area, is exemplary of the suggested vegetative corridor to be established.

Photograph 3:

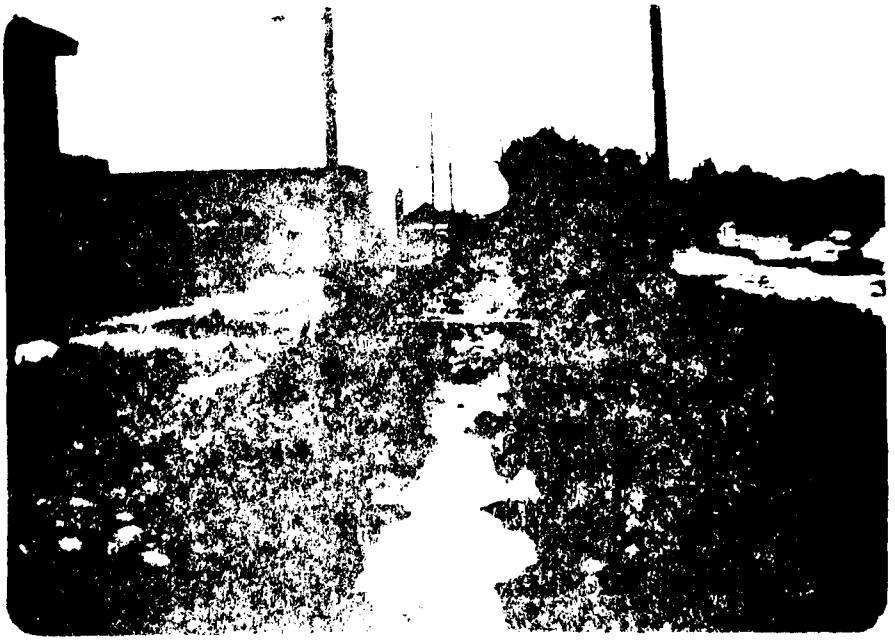
This area is located immediately upstream of Fourth Avenue. In this area considerable revegetation should be provided to maintain a contiguous vegetated riparian corridor extending downstream to Interstate 5.

Photograph 4:

This area is located immediately downstream of Fourth Avenue and shows clearly that revegetation (as in most other locations on Telegraph Creek) was never implemented.

Photograph 5.

This area is located immediately upstream of Fifth Avenue and shows several introduced plant species.



Photograph 6.

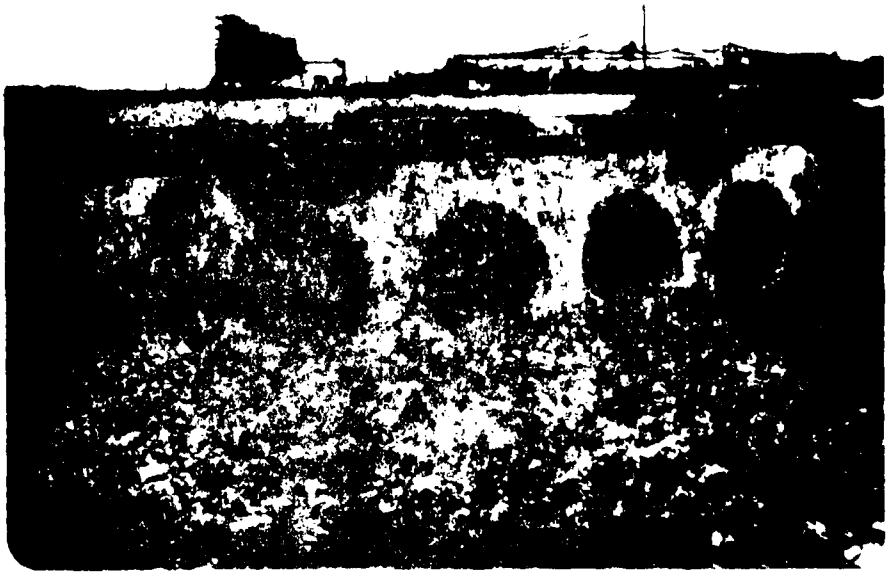
This area is located immediately downstream of Fifth Avenue and shows the continuous lack of revegetation necessary to offset project induced habitat losses.

Photograph 7:

This area is located immediately upstream of Broadway Avenue, again depicting the extensive need for revegetation to provide habitat for public fish and wildlife resources.

Photograph 8:

This area is located upstream of Industrial Avenue.



Photograph 9:

This area shows how Telegraph Creek passes under Interstate 5.

We believe that the entire stretch of Telegraph Creek between 3rd Avenue and Highway 5 offers many good opportunities for revegetation. Revegetation of habitats along Telegraph Creek will help compensate for permanent losses of land (channelization) which is now in the process of natural plant and animal succession. Maintenance of natural vegetation along Telegraph Canyon is highly desirable as it provides a corridor for animal movement and provides open space and esthetic benefits.

The attached species list includes most of the flora and fauna known or believed to be present within the proposed project area. Those species checked in red are indicative of those recommended for revegetation as compensation for project induced adverse impacts (i.e. loss of land) to public fish and wildlife resources.

Sincerely yours,

Ralph C. Pisapia
Field Supervisor

KGH:rm
Attachment

cc: CE-LA, Env. Planning Section
CDFG, Reg. 5, Long Beach, CA

ATTACHMENT

FWS Planning Aid Letter
May 11, 1979

BIRDS

R = Resident
M = Migrant
B = Breeding in San Diego Bay
BL= Breeds

Common Name	Scientific Name	Remarks
Common loon	Gavia immer	M
Arctic loon	Gavia arctica	M
Red-throated loon	Gavia stellata	M
Horned grebe	Podiceps auritus	M
Eared grebe	Podiceps caspicus	M
Western grebe	Aechmophorus occidentalis	M
Pied-billed grebe	Podilymbus podiceps	M (Listed as resident in Stephens 1919)
White pelican	Pelecanus erythrorhynchos	M, BL
Brown pelican	Pelecanus occidentalis	M (Considered abundant by Stephens 1919)
Double-crested cormorant	Phalacrocorax auritus	R, BL
Brandt's cormorant	Phalacrocorax penicillatus	R, BL
Pelagic cormorant	Phalacrocorax pelagicus	R, BL
Great blue heron	Ardea herodias	R, BL
Green heron	Butorides virescens	R, BL (Listed as extirpated by Stephens 1919)
Common egret	Casmerodius albus	R
Snowy egret	Leucophoyx thula	R (Listed as extirpated by Stephens 1919)
Louisiana heron	Hydranassa tricolor	M
Black-crowned night heron	Nycticorax nycticorax	R, BL
Least bittern	Ixobrychus exilis	R
American bittern	Botaurus lentiginosus	R
Wood ibis	Mycteria americana	M
White-faced ibis	Plegadis chihi	M

American flamingo	Phoenicopterus ruber	R (Recently introduced)
Whistling swan	Olor columbianus	M (Rarely)
Canada goose	Branta canadensis	M (Rarely-formerly common)
Black brant	Branta nigricans	M (Rarely-formerly common)
White-fronted goose	Anser albifrons	M (Rarely-formerly common)
Snow goose	Chen hyperborea	M (Rarely-formerly common)
Mallard	Anas platyrhynchos	M. BL
Gadwall	Anas strepera	M
Pintail	Anas acuta	M
Green-winged teal	Anas carolinensis	M
Blue-winged teal	Anas discors	M
Cinnamon teal	Anas cyanoptera	R, BL
American widgeon	Mareca americana	M
Shoveler	Spatula clypeata	M
Redhead	Aythya americana	M
Ring-necked duck	Aythya collaris	M
Canvasback	Aythya valisineria	M
Greater scaup	Aythya marila	M
Lesser scaup	Aythya affinis	M
Common goldeneye	Bucephala clangula	M
Bufflehead	Bucephala albeola	M
Oldsquaw	Clangula hyemalis	M
White-winged scoter	Melanitta deglandi	M
Surf scoter	Melanitta perspicillata	M
Common scoter	Oidemia nigra	M
Ruddy duck	Oxyura jamaicensis	M
Hooded merganser	Lophodytes cucullatus	M
Common merganser	Mergus merganser	M
Red-breasted merganser	Mergus serrator	M
White-tailed kite	Elanus leucurus	R
Cooper's hawk	Accipiter cooperi	R
Red-tailed hawk	Buteo jamaicensis	R
Ferruginous hawk	Buteo regalis	M
Bald eagle	Haliaeetus leucocephalus	Formerly a rare resident visitor - Rare Listed endangered gered by FWS & CDFG
Marsh hawk	Circus cyaneus	R

Osprey	Pandion haliaetus	Visitor-Formerly a resident (Stephens 1919)
Prairie falcon	Falco mexicanus	R
Peregrine falcon	Falco peregrinus	R
Pigeon hawk	Falco columbarius	M
Sparrow hawk	Falco sparverius	R, BL
California quail	Lophortyx californicus	R, BL
Light-footed clapper rail	Rallus longirostris	B (Formerly common resident nearly extinct. Listed endangered by FWS & CDFG)
Virginia rail	Rallus limicola	R, B
Sora rail	Porzana carolina	R
Black rail	Laterallus jamaicensis	R, B
Common gallinule	Gallinula chloropus	M
American coot	Fulica americana	R, BL
Semipalmated plover	Charadrius semipalmatus	M
Snowy plover	Charadrius alexandrinus	R, B (Population declining, Sams 1959)
Killdeer	Charadrius vociferus	R, B
Mountain plover	Eupoda montana	M
American golden plover	Pluvialis dominica	M
Black-bellied plover	Squatarola squatarola	M
Surfbird	Aphriza virgata	M
Ruddy turnstone	Arenaria interpres	M
Black turnstone	Arenaria melanocephala	M
Common snipe	Capella gallinago	M
Long-billed curlew	Numenius americanum	M (Population declining. Stephens 1919)
Whimbrel	Numenius phaeopus	M
Spotted sandpiper	Actitus macularia	M
Solitary sandpiper	Tringa solitaria	M
Wandering tattler	Heteroscelus incanus	M
Willet	Catoptophorus semipalmatus	M
Greater yellowlegs	Totanus melanoleucus	M

Lesser yellowlegs	Totanus flavipes	M
Knot	Caladris canutus	M
Pectoral sandpiper	Erolia melanotos	M
Least sandpiper	Erolia minutilla	M
Dunlin	Erolia alpina	M
Short-billed dowitcher	Limnodromus griseus	M
Long-billed dowitcher	Limnodromus scolopaceus	M
Western sandpiper	Ereunetes mauri	M
Marbled godwit	Limosa fedoa	M
Sanderling	Crocethia alba	M
American avocet	Recurvirostra americana	R, B
Black-necked stilt	Himantopus mexicanus	R, B
Red phalarope	Phalaropus fulicarius	M
Wilson's phalarope	Steganopus tricolor	M
Northern phalarope	Lobipes lobatus	M
Parasitic jaeger	Stercorarius parasiticus	M
Long-tailed jaeger	Stercorarius longicaudus	M
Glaucous-winged gull	Larus glaucescens	M
Western gull	Larus occidentalis	R, BL
Herring gull	Larus argentatus	M
California gull	Larus californicus	M
Ring-billed gull	Larus delawarensis	M
Mew gull	Larus canus	M
Bonaparte's gull	Larus philadelphia	M
Heermann's gull	Larus heermanni	M
Black-legged kittiwake	Rissa tridactyla	M
Sabine's gull	Xema sabini	M
Forster's tern	Sterna forsteri	R, B
Common tern	Sterna hirundo	M
Least tern	Sterna albifrons	R, B (Listed endangered by FWS & CDFG--formerly abundant)
Royal tern	Thalasseus maximus	R, B
Elegant tern	Thalasseus elegans	R, B
Caspian tern	Hydroprogne caspia	R, B
Black tern	Chlidonias niger	M
ock dove	Columba livia	R, BL
Mourning dove	Zenaidura macroura	R, BL
Barn owl	Tyto alba	R, BL
Screech owl	Otus asio	R
Burrowing owl	Speotyto cunicularia	R, BL
Short-eared owl	Asio flammeus	R

Black-chinned hummingbird	Archilochus alexandri	R
Anna's hummingbird	Calypte anna	R, BL
Allen's hummingbird	Selasphorus sasin	M
Belted kingfisher	Megaceryle alcyon	R (Population declining-Sams 1959)
Cassin's kingbird	Tyrannus vociferans	R
Black phoebe	Sayornis nigricans	R, BL
Say's phoebe	Sayornis saya	R
Horned lark	Eremophila alpestris	R, BL
Long-billed marsh wren	Telmatodytes palustris	R
Mockingbird	Mimus polyglottos	R, BL
Loggerhead shrike	Lanius ludovicianus	R, BL
Starling	Sturnus vulgaris	R, BL (Introduced)
Yellowthroat	Geothlypis trichas	R, BL
House sparrow	Passer domesticus	R, BL (Introduced)
Western meadowlark	Sturnella neglecta	R, BL
Red-winged blackbird	Agelaius phoeniceus	R
Brewer's blackbird	Euphagus cyanocephalus	R, BL
House finch	Carpodacus mexicanus	R, BL
Brown towhee	Pipilo fuscus	R, BL
Savannah sparrow	Passerculus sandwichensis	R, BL
Song sparrow	Melospiza melodia	R, BL

FISH

Horn shark	Heterodontus francisci	Very abundant
Leopard shark	Triakis semifasciata	Abundant in summer
Brown smoothhound	Triakis henlei	
Soupfin shark	Galeorhinus zyopterus	Common in bay
Pacific angel shark	Squatina californica	In bay throughout year
Banded guitarfish	Zapteryx exasperata	
Round stingray	Urolophus halleri	Very common
Bat stingray	Myliobatis californicus	Common
Bonefish	Albula vulpes	Occasional
Pacific herring	Clupea harengus pallasi	Spawns in bay Sept. through Feb.
Pacific sardine	Sardinops sagax	Very abundant Sept. through Mar.
Northern anchovy	Engraulis mordax	Very abundant in large schools during summer

Slough anchovy	Anchoa delicatissima	Very abundant Mar. to Sept.
Deepbody anchovy	Anchoa compressa	Quite common
California halfbeak	Hyporhamphus rosae	Common throughout year, spawns in bay
California needlefish	Strongylura exilis	
California killifish	Fundulus parvipinnis	
Jacksmelt	Atherinopsis californiensis	Important food fish in bay Nov. through Jan.; spawns in bay, young use bay for nursery area
Topsmelt	Atherinops affinis	Abundant throughout year
California grunion	Leuresthes tenuis	
Barred pipefish	Syngnathus auliscus	
Pacific seahorse	Hippocampus ingens	
Kelp bass	Paralabrax clathratus	
Spotted sand bass	Paralabrax maculatofasciatus	Permanent resident; abundant during fall and early winter
Sand bass	Paralabrax nebulifer	
Sargo	Anisotremus davidsoni	Quite common Apr. to Nov.;good food fish
Spotfin coraker	Roncador stearnsi	Important food fish
Black croaker	Cheilotrema saturnum	Common Jan. through Mar.;breeds in bay; common food fish
White croaker	Genyonemus lineatus	Abundant in winter; spawns in bay
Yellowfin croaker	Umbrina roncador	Abundant in bay May & Jan.
California corbina	Menticirrhus undulatus	Abundant at times between July & Jan.
White seabass	Cynoscion nobilis	Young in bay Apr. through Nov.
Shortfin corvina	Cynoscion parvipinnis	In bay Mar.to Dec.
Dwarf perch	Micrometrus minimus	Very abundant in eelgrass; breeds in bay during winter
Shiner perch	Cymatogaster aggregata	Very abundant
Walleye surfperch	Hyperprosopon argenteum	Very abundant

Black perch	Embiotoca jacksoni	Very common
White seaperch	Phanerodon furcatus	Most common species in bay
Striped mullet	Mugil cephalus	Very abundant mid-Feb.;ascend coastal streams;young remain in bay all year
Pacific barracuda	Sphyraena argentea	Young, less than a foot long, enter bay in great numbers during spring
Giant kelpfish	Heterostichus rostratus	
Bay blenny	Hysoblennius gentilis	
Longjaw mudsucker	Gillichthys mirabilis	Very abundant in sloughs and mudflats; spawns in Mar.
Pacific bonito	Sarda chiliensis	Very common
Pacific pompano	Palometa simillima	
California scorpionfish	Scorpaena guttata	Very abundant around piles and wharves
Pacific staghorn sculpin	Leptocottus armatus	
Fantail sole	Xystreurys liolepis	
California halibut	Paralichthys californicus	Young abundant in bay throughout year; juvenile enter bay in Feb.
Diamond turbot	Hypsopsetta guttulata	Large numbers enter bay in Feb. & Mar.; many taken in sport and commercial catch
C-O sole	Pleuronichthys coenosus	Abundant in bay
Gray smoothhound	Mustelus californicus	
Shovelnose guitarfish	Rhinobatos productus	
Spiny dogfish	Squalus acanthias	
Slim midshipman	Porichthys myriaster	
Bay pipefish	Syngnathus griseolineatus	
Giant sea bass	Stereolepis giga	
Opaleye	Girella nigricans	
Queenfish	Seriphus politus	
Arrow goby	Clevelandia ios	

Cheekspot goby	Ilypnus gilberti
Shadow goby	Quientula y-cauda
Cabezon	Scorpaenichthys marmortus
Jack mackerel	Trachurus symmetricus

MARINE INVERTEBRATES

CRUSTACEANS

Acorn barnacle	Balanus amphitrite
Corophiid amphipod	Erocthonius brasiliensis
Beach hopper	Orichestia fraskiana
Large beach hopper	Orchestoidea californiana
Sphaeromid isopod	Cilicaea sculpta
Seriolod isopod	Seriolis carinata
Rock louse	Ligia cf. occidentalis
Mudflat crab	Hemigrapsus oregonensis
Spider crab	Pyromaia tuberculata
Pea crab	Fabia subquadrata
Xanthed crab	Lophopanopeus lockingtoni
Fiddler crab	Uca crenulata
Herog mudflat crab	Speocarcinus californiensis
Transparent shrimp	Spirontocaris paludicola
Grass shrimp	Hippolyte californyensis
Ghost shrimp	Callianasso californiensis
Crangonid shrimp	Processa canaliculata
Mantis shrimp	Squilla polita

MOLLUSKS

Banded cockle	Chione californiensis
Smooth cockle	Chione fluctifraga
Wavy cockle	Chione undatella
Burrowing clam	Cooperelia subdiaphana
San Diego pea-pod	Adula diegensis
Egg-shell slam	Laevicardium substriatum
California lyonsia	Lyonsia californica
Whi.. macoma	Macoma secta
Bent-nosed clam	Macoma nasuta
Common littleneck	Protothaca staminea
Roughsided littleneck	Protothaca laciniata
California dish clam	Mactra californica
Ribbed mussel	Modiolus demissus
Bay mussel	Mytilus edulis

Gaper	Schizothaerus nuttalli
Rosy razor clam	Solen rosaceus
California jackknife clam	Tagelus californianus
Jackknife clam	Tagelus subteres
Washington clam	Saxidomas nuttalii
Purple clam	Sanguinolaria nuttalli
Glassy bubble	Acteocina magdalenensis
Gould's bubble	Bulla gouldiana
California horn snail	Cerithidea californica
Onyx slipper shell	Crepidula onyx
Slipper limpet	Crepidula norrisarum
Cup-and-saucer limpet	Crucibulum spinosum
Blister paper bubble	Haminoea vesicula
Chink shell	Lacuna marmorata
Carinate dove shell	Mitrella carinata
Mud nassa	Nassarius tegula
Channeled nassa	Nassarius fossatus
Penciled turret shell	Ophiodermella ophioderma
Olive ear shell	Melampus olivaceus

MARINE FLORA

SUB-TIDAL SPECIES

Red alga	Antithamnion sp.
Green alga	Chaetomorpha spp.
Green alga	Cladophora sp.
Red alga	Dasya pacifica
Filamentous green alga	Enteromorpha spp.
Red alga	Gigartina sp.
Red alga	Gracilaria verrucosa
Red alga	Griffithsia sp.
Red alga	Hypnea valentiae
Red alga	Polysiphonia pacifica
Green alga	Rhizoclonium sp.
Green alga	Ulothrix sp.
Sea lettuce	Ulva latissima
Sea lettuce	Ulva lobata
Eelgrass	Zostera marina

SALT MARSH SPECIES

Salt grass	Distichlis spicata
Salt cedar	Monanthochloe littoralis

Sickle grass	Parafolis incurva
Cordgrass	Spartina foliosa
Arrow grass	Triglochin maritima
Ditch grass	Ruppia maritima
Ice plant	Mesembryanthemum crystallinum
Little ice plant	Mesembryanthemum nodiflorum
Saltwort	Batis maritimum
Chinese pusley	Heliotropium curassavicum var. occulttum
Salt marsh sand spurrey	Spergularia marina
Watson saltbush	Atriplex watsonii
Annual pickleweed	Salicornia bigelovii
Saltflat annual pickleweed	Salicornia europea
Glasswort	Salicornia subterminalis
Pickleweed	Salicornia virginica
California seablite	Suaeda californica
California seablite	Suaeda torreyana
Coast weed	Amblyopappus pusillus
Jaumea	Jaumea carnasa
Alkali weed	Cressa turxillensis var. vallicola
Salt marsh dodder	Cuscuta salina var. squamigera
Pigmy weed	Tillaea erecta
Alkali heath	Frankenia grandifolia
Yerba reuma	Frankenia palmeri
Sea lavender	Limonium californicum var. mexicanum

MARITIME BRUSH SPECIES

Spanish bayonet, mojave yucca	Yucca schidigera
Red brome	Bromus rubens
Sterile barley	Horedum murinum
Sea fig, ice plant	Mesembryanthemum chilense
California pepper tree	Schinus molle
Tree tobacco	Nicotiana glauca
Tamarisk	Tamarix sp.
Sweet fennel	Foeniculum vulgare

BRACKISH WATER SPECIES

Rabbit-foot grass	Polypogon monspeliensis
Spiny rush	Juncus acutis var. sphaerocarpus
Common cattail	Typha latifolia
Mule-fat	Baccharis viminea
Brass buttons	Cotula coronopifolia
Common knot weed	Polygonum aviculare
Curley dock	Rumex crispus
Arroyo willow	Salix lasiolepis
Several introduced species	

SPLED-EP 9 October 1979

Mr. R. Kahler Martinson, Regional Director
U.S. Fish and Wildlife Service
Lloyd 500 Building, Suite 1692
500 N.E. Multnomah Street
Portland, Oregon 97232

Dear Mr. Martinson:

This is in further response to your Biological Opinion letter of 25 January 1979 (your file: AFA-SE, 1-1-78-95) which you prepared pursuant to the formal Section 7 consultation under the Endangered Species Act of 1973 for the proposed Telegraph Canyon Creek project and its effects on endangered species. Your letter outlined conditions to ensure the proposed project would not likely jeopardize either the California least tern or the light-footed clapper rail. Condition 3 stated that no work should be conducted bayward of the 5-foot contour line (datum MSL) at the confluence of Telegraph Canyon Creek and San Diego Bay. Our response, dated 16 March 1979, indicated that, in general, the Corps concurred with your conditions, including condition 3.

Since that time, further studies have led the Los Angeles District to recommend that the excavation be allowed to continue from the plus 5-foot contour to the plus 4-foot contour. This change will reduce the exit velocity of the channel discharge from 9.2 feet per second to 7.6 feet per second and greatly reduce the scour of the J Street marsh during high discharges. The proposed design modification is not expected to result in any short-term or long-term adverse impacts on the marsh. Over a period of time, if any change should occur, it would most likely be an increase in the size of the marsh. The proposed modification is shown on the inclosed plan and profile (incl 1). Although it is not shown on the plan, the entrance channel will be faced with rock.

SPLED-EP 9 October 1979
Mr. R. Kahler Martinson, Regional Director

Based on the above assessment of the proposed modification, the District does not plan to reopen the Section 7 consultation. If you have any questions regarding the proposed change, please contact Ms. Laura Tschudi, Environmental Planning Section, at (213) 688-5421 (FTS 798-5421) at your earliest possible convenience.

Sincerely,

1 Incl
As stated

GWYNN A. TEAGUE
Colonel, CE
District Engineer

SPLED-EP 16 March 1979

Mr. R. Kahler Martinson, Regional Director
U.S. Fish and Wildlife Service
Lloyd 500 Building, Suite 1692
500 N.E. Multnomah Street
Portland, Oregon 97232

Dear Mr. Martinson:

Reference is made to your 25 January 1979 letter pursuant to the Section 7 consultation under the Endangered Species Act of 1973 for the proposed Telegraph Canyon Creek Project, San Diego County, California (Case No. 1-1-78-F-95). In general, the comments can be accommodated, and the following paragraphs contain responses to comments in the referenced letter.

In the second paragraph of the letter, it is stated that the project "includes placement of the channel into and through the J Street Marsh". The project has been very carefully designed to avoid construction in the marsh, and channel construction will end at the downstream end of the San Diego Gas and Electric Company fill area (at the 5-foot contour line).

In general, construction methodologies recommended on pages 2 and 3 of your letter can be accommodated. A dragline (or other comparable construction equipment which would be least-damaging to the marsh area) will be specified for channel work at the mouth of the creek (comment 4, page 2). All excavated spoil will be disposed of outside of the creek area (comment 7, page 3). Construction specifications will require the contractor to control all pollutants (including sediments) to avoid pollution of streamflows entering the J Street Marsh (comment 6, page 3). It is not anticipated that project features to control long-term sediment transport (comment 2, page 2) will be required due to the lack of sediments normally associated with urban runoff (it is felt that most of the sediments transported to the J Street Marsh area originate from the undeveloped areas in the upper drainage area, which are gradually urbanizing). The recommendation proposing a notch in the stabilizer near each bank at the mouth of the creek will be implemented to allow for maintenance of tidal flushing in the channel area upstream (comment 5, page 2).

SPLED-EP 16 March 1979
Mr. R. Kahler Martinson

Your recommendation that channel construction be accomplished between September and March to avoid disturbance in the vicinity of the marsh area during the nesting season would appear to be appropriate for construction below Interstate 5 Freeway only (comment 1, page 2). Since both the light-footed clapper rail and the California least tern have somewhat adapted to the urban environment, it might be appropriate to designate an "influence zone" which defines an area in which construction noise raises ambient noise levels in the marsh area significantly to interrupt nesting in the area. Construction within this "influence zone" could very well be limited to between September and March and avoid all disturbance to the nesting habits that could result from the project. In the case of Telegraph Canyon Creek, it would appear that construction noises would be insignificant at a point about 500 feet from the mouth of the creek (where the San Diego Gas and Electric Company activities begin).

With respect to enhancement measures proposed on page 3 of your letter, excavation required for channel construction upstream of the mouth of the creek will increase the tidal influence and effectively create new intertidal marsh area (comments 1 and 3, page 3). It is anticipated that cordgrass and pickleweed would quickly become established in the newly created intertidal area, but some planting of these species can be accomplished in the area subsequent to completion of channel construction as a project feature to accelerate this establishment (comment 2, page 3). It is not anticipated, however, that operation and maintenance of the project can extend into the marsh area in terms of a management program as this area is not considered to be a part of the project area (comment 4, page 3).

It is considered by this District that we are essentially in agreement with your office in the determination that the proposed Telegraph Canyon Creek flood control project will not jeopardize the continued existence of either the light-footed clapper rail or the California least tern, subject to resolution of the extent of the "influence zone" as discussed previously in this letter. Your opinion on this concept relative to the J Street March area would be appreciated in order to complete the consultation on the project.

Sincerely yours,

GWYNN A. TEAGUE
Colonel, CE
District Engineer

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

January 25, 1979

In reply refer to:
AFA-SE, 1-1-78-F-95

Colonel Gwynn A. Teague
District Engineer
Department of the Army
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Colonel Teague:

The following comments have been prepared pursuant to the formal Section 7 consultation under the Endangered Species Act of 1973 for the proposed Telegraph Canyon Creek Project and its effects on endangered species. The consultation was requested by your letter of August 8, 1978, and has been assigned case number 1-1-78-F-95. The proposed work is described in detail in the draft Telegraph Canyon Creek information brochure published by your office in September 1978.

Briefly, the work involves construction of a concrete channel from 400 feet upstream of 4th Avenue to Interstate 5, and the construction of an earth-bottom channel 0.4 mile in length starting at Interstate 5 and terminating in San Diego Bay, at an area locally known as the J Street Marsh. The proposal includes placement of the channel into and through the J Street Marsh. In the fall of 1978, two coordination meetings were held at the Corps of Engineers (CE) Los Angeles office with CE personnel from the Water Resources Branch and Fish and Wildlife Service personnel from our Laguna Niguel Field Office (LNFO). During these meetings, various aspects of the proposed project were discussed and conditioned to make the project as environmentally acceptable as possible. Additional information was also requested and later provided by letter dated December 11, 1978.

Of concern in this consultation is the possible effect your proposal may have on the California least tern (Sterna albifrons browni) and the light-footed clapper rail (Rallus longirostris levipes). The California least tern is a migratory bird that arrives on its breeding grounds the last week in April. The prime nesting season is considered to be May 15 to early August of each year. Late season renesting is a significant factor and, therefore, July and August are important months.

The California least tern selects a nesting site on an open expanse of sand beach near a lagoon or wetland where food is available. Formerly ocean beaches were used but increased human activity on southern California beaches has rendered them unsuitable. Loss of nesting habitat is considered to be a major factor in the decline of the species, however, the proposed project would not impact any known nesting site. Marsh areas such as the J Street Marsh are increasingly more important in conservation of the species, because of the importance to the maintenance of the prey items for the tern.

The light-footed clapper rail is a year-round resident of coastal salt marshes in southern California. The preferred habitat for the rail is the low salt marsh dominated by cordgrass (Spartina sp.) vegetation but it will utilize high salt marsh or freshwater marsh land for feeding and shelter. Thus, the entire wetland area of the J Street Marsh is valuable and productive habitat for these endangered species. Any loss of this marsh would affect the rail. Our primary concern is that all the wetland habitat be protected insofar as possible.

In an effort to achieve this end, we believe specific measures should be incorporated into your project plans so that any potential impacts would be eliminated. It is, therefore, the opinion of the FWS that the proposed activities will not likely jeopardize either the California least tern or the light-footed clapper rail provided the following conditions are implemented:

1. All work is accomplished between September and March, to avoid the nesting season for both species;

2. Measures are implemented to insure that abnormal pollution and siltation of the J Street Marsh will not occur;

3. No work be conducted bayward of the 5-foot contour line (Datum MSL) at the confluence of Telegraph Creek and San Diego Bay;

4. Machinery will neither enter the J Street Marsh area (i.e. bayward of the five-foot contour line), nor disrupt any existing wetland vegetation in connection with it. A dragline is recommended for excavation to assure compliance with this condition;

5. The proposed stabilizer located at the mouth of Telegraph Creek will be notched near each bank to provide adequate tidal exchange;

6. Measures will be implemented during the construction phase to prevent all pollutants from construction, including sediments, from entering San Diego Bay; and

7. All excavation spoils will be deposited on upland (non-wetland) sites.

It should be noted that if these conditions are not implemented, the proposed project would jeopardize the continued existence of the light-footed clapper rail because habitat for this species would be impacted.

We would also like to emphasize that the CE has the opportunity to utilize this project authority to promote the conservation of these two endangered species as outlined in Section 7 of the Endangered Species Act by enhancing the J Street Marsh as habitat for the California least tern and the light-footed clapper rail. This can be accomplished by:

1. Increasing the intertidal area available for saltwater intrusion about the existing 5-foot contour line, such that the marsh itself can be increased in size;

2. Planting native salt marsh vegetation in the expanded intertidal area;

3. Increasing tidal exchange at the confluence of Telegraph Canyon Creek; and

4. Implementing an ecologically-based management plan for the J Street Marsh.

This concludes our consultation on the Telegraph Canyon Creek project. We would appreciate notification of your intent on this project, in light of this opinion. We would also recommend that you consider reinitiation of consultation should you consider any modification to the project other than the seven conditions discussed above or if new information on listed species becomes available.

Sincerely yours,

Bill Meyer

William H. Meyer
Actin- Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: ES

March 10, 1976

1518.01 San Diego stream flowing to Ocean

Colonel John V. Foley
District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Colonel Foley:

Enclosed is one copy of our detailed report on effects the proposed Telegraph Canyon Creek Flood Control project, San Diego County, California, would have on fish and wildlife resources. Additional copies are available from our Laguna Niguel field office.

Sincerely yours,

Don Reese

Don Reese
Regional Supervisor
Division of Ecological Services

Enclosure

Distribution:

3 - Bureau of Outdoor Recreation, San Francisco
7 - California Department of Fish and Game, Sacramento
1 - National Marine Fisheries Service, Terminal Island
1 - Environmental Protection Agency, San Francisco
3 - Director, Fish and Wildlife Service, Washington, DC
5 - California Department of Fish and Game, Long Beach
1 - (each) Ecological Services, Boise, Sacramento, Olympia, Honolulu, Portland (field offices)
15 - Ecological Services, Laguna Niguel

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: ES

March 4, 1976

Colonel John V. Foley
District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

This is our detailed report on the effects the Telegraph Canyon Creek Flood Control project, San Diego County, California would have on fish and wildlife. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Our report is for inclusion in your interim survey report on the project authorized for study under Section 4 of the Flood Control Act of 1941. Our analysis is based on project information supplied by your office prior to February 8, 1976. This report has been reviewed and concurred in by the California Department of Fish and Game as indicated by the appended copy of a letter from Director E. C. Fullerton dated January 26, 1976.

PROJECT DESCRIPTION

Flood control works proposed for Telegraph Canyon Creek include:

Modification of the existing .4-mile-long earth-bottom trapezoidal channel between the mean higher high water elevation of San Diego Bay and Interstate Highway 5. The bottom width of the channel would be 20 feet, with a depth of 10 feet, and would follow the alignment of the existing channel. Right-of-way width for this portion of the project would be 100 feet. An energy dissipator would be constructed immediately downstream of Highway I-5, and an unpaved service road would be constructed adjacent to the channel.

An existing 1/2-mile-long, four-barrel culvert under Interstate Highway 5.

A 1.0-mile-long open rectangular-concrete channel from Industrial Avenue to 4th Avenue with a width of 20 feet and a depth of 7 feet. A fence would be constructed at the top of the channel walls, and a paved service road would be constructed adjacent to the channel. Right-of-way width for the concrete channel would be about 40 feet. The proposed channel would follow the existing channel alignment.

A modification of the road crossings at National Avenue, 5th Avenue, and 4th Avenue.

An inlet structure from 4th Avenue to about 400 feet upstream from 4th Avenue. The inlet would be about 63 feet wide at the widest point, and would be about 25 feet wide at 4th Avenue. The inlet would be concrete and follow the existing creek alignment.

A 4-acre rest and staging area upstream from 4th Avenue and adjacent to the channel inlet. This area would feature picnic tables, a restroom, limited parking, playfields, and landscaping with trees, shrubs, and groundcover.

A hiking-biking trail using the proposed access road. The trail would originate at 4th Avenue and would end at Industrial Avenue. A program of landscaping would accompany the trail system; about 8 feet of the 40-foot right-of-way would be used for this purpose, and it would be landscaped with plant material requiring low maintenance.

The project is expected to increase peak flood flows from 1,600 cfs to about 2,200 cfs for a 60-year flood downstream of I-5. The channelization of stream flow will restrict the entry into the J Street Marsh to a point discharge. The project will not affect flows as a result of 7-year and lesser floods.

Operation and maintenance of the project facilities would be by local agencies.

FISH

Without the project

Telegraph Canyon Creek is an intermittent stream and does not support a fishery.

The J Street Marsh is located immediately downstream from the proposed construction area. It extends from J Street south to the groin at the intake to the San Diego Gas and Electric power facility and consists of approximately 8.5 acres of mudflats, 11.5 acres of Salicornia and Spartina, and 1.0 acres of upland habitat. The J Street Marsh is a remnant of the salt marsh that once extended around most of San Diego Bay. The present fishery is limited to clamming activities for smooth chione (Chione fluctifraga) and an occasional common littleneck clam (Protothaca staminea). The proximity of the marsh to the San Diego Gas and Electric Company property and the lack of direct access to the marsh contribute to the lack of recreational activities. The marsh and mudflats do, however, provide food and cover for such fish as juvenile topsmelt and diamond turbot. In addition, shadow gobies and California killifish are present in large numbers. These forage fish provide food for game fish and shorebirds. Without the project, the marsh should continue to exist in its present form.

With the project

We do not expect the project to change conditions for fish or other aquatic life in Telegraph Canyon Creek. No losses will result, and no opportunities for enhancement exist.

Increased flows as a result of floods of a magnitude greater than a 7-year frequency is expected to have no significant impact upon the J Street Marsh. However, the confinement of flood waters to a point discharge could ultimately reduce the present limited effect of freshwater entry to the marsh.

We anticipate no change in the clam or bait fishery in the marsh as a result of the project.

WILDLIFE

Without the project

Telegraph Canyon Creek currently has no known populations of big game animals or waterfowl. Mammal populations appear to be limited to California ground squirrels, blacktail hare, and various species of rats and mice. Resident birds include the house finch, meadowlark, mockingbird, Belding's savannah sparrow, and scrub jay. Various migratory birds can be found occasionally within the project area at appropriate seasons. Water and marsh birds may occur occasionally during periods of stream flow.

Telegraph Canyon Creek offers minimal habitat for wildlife. Between 4th Avenue and Interstate Highway 5, the channel is, for the most part, devoid of vegetation, food, and cover. The creek channel downstream from Interstate Highway 5 contains various native and exotic grasses and other plants which provide food and cover for songbirds and small mammals. This reach is the most important riparian habitat within the construction area. The channel between 3rd Avenue and 4th Avenue contains stands of giant reed (Arundo donax) which also provide cover for songbirds and small mammals.

Without the project, the present habitat along Telegraph Creek is expected to decline. Due to extensive urbanization, hunting is not allowed.

The J Street Marsh is a regularly flooded salt marsh. It contains extensive areas of pickleweed (Salicornia) with smaller patches of cordgrass (Spartina). It is a significant area for waterfowl and shorebirds in that it provides both food and cover for many species. There are 180 species of birds known to frequent the San Diego Bay area. Birds currently observed within the marsh include the light-footed clapper rail, listed as endangered by the U. S. Fish and Wildlife Service, and Belding's savannah sparrow, listed as endangered

by the California Department of Fish and Game. Other endangered species known to occur in nearby salt marshes include the California least tern, American peregrine falcon, and the brown pelican.

The J Street Marsh provides no waterfowl hunting due to its location within the city limits of Chula Vista. Without the project, the J Street Marsh would continue to provide excellent food and cover for both marsh and shorebirds.

With the project

Construction of both lined and unlined channels along Telegraph Canyon Creek will eliminate all existing vegetation of value to wildlife on the site of the proposed facilities. Losses along Telegraph Canyon Creek are not considered to be significant and would be offset by park development.

With the project, there is expected to be no change in the wildlife use and habitat value of the J Street Marsh.

DISCUSSION

The present limited value of the streambed for wildlife with its attendant rubbish and barren earth will be improved by the proposed project. The establishment of trees and shrubs would provide habitat for various songbirds tolerant of human activities. We believe, therefore, that sufficient mitigation would be provided to offset the loss of the intermittent stream bottom habitat and adjacent upland areas.

RECOMMENDATIONS

We recommend:

1. That wildlife habitat be preserved, wherever possible during construction of the project.

2. That project maintenance activities requiring chemical control of plant or animal life be accomplished with methods and materials acceptable to the Corps of Engineers, the U. S. Public Health Service, the California Regional Water Quality Control Board, the California Department of Fish and Game, and the U. S. Fish and Wildlife Service.

3. That the proposed rest and staging area and trail system be landscaped with a variety of trees and shrubs that will provide food and cover for native songbirds. Possible choices include the California peppertree, laurel sumac, toyon, live oak, pink, California black walnut, fig, and blueberry elder.

4. That the selection of plant species and the location of plantings be coordinated with the U. S. Fish and Wildlife Service and the California Department of Fish and Game.

5. That weepholes be provided within the concrete portion of the channel in order to facilitate groundwater recharge.

6. That construction activities near the J Street Marsh be undertaken during the summer drought period in order to minimize disturbance to migratory waterfowl.

Please advise us of your intended actions concerning our recommendations. We request written notification if project plans are materially altered so that, if necessary, we can provide you with a revised report or additional comments on project effects on fish and wildlife.

We appreciate the excellent cooperation extended by your staff during our studies and preparation of this report.

Sincerely yours,

William H. Meyer

William H. Meyer
Acting Regional Director

Attachments (2)

APPENDIX I

ECONOMICS

APPENDIX I

ECONOMICS

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Tables

Plates

APPENDIX I

ECONOMICS OF ALTERNATIVE PLANS

1. An important element in the array of factors used for comparing alternatives on selecting a plan is economic efficiency, typically measured "net benefits," the excess of benefits over costs. The major categories of benefits are: flood control benefits, which are further subdivided into inundation reduction benefits and location benefits. There are also incidental benefits such as advance replacement of bridges.

AFFECTED AREA

2. Telegraph Canyon Creek is located about 8 miles south of downtown San Diego. It originates in the foothills of the San Miguel Mountains in an unincorporated part of San Diego County east of the City of Chula Vista. From its point of origin west to Hilltop Drive, the overflow area is extremely narrow and is confined to the bottom of Telegraph Canyon, encompassing only Telegraph Canyon Road and a small area of adjoining vacant land. West of Hilltop Drive to 3rd Avenue in Chula Vista, the standard project flood (SPF) would inundate a neighborhood of single-family residences, interposed with three fairly large undeveloped parcels. A commercial development is in the overflow area at the intersection of 3rd Avenue and L Street. A single-family residential neighborhood is in the overflow area west to 5th Avenue. From 5th Avenue west to Interstate 5, the standard project flood branches to cover a considerable area of mixed single-family residences and apartment buildings. Manufacturing establishments are located in this section of the area immediately east of the freeway. Ponding north of the main overflow area and east of Interstate 5 would inundate a block of apartment buildings and four blocks of single-family residences. Part of the San Diego Gas and Electric Company facility that is between Interstate 5 and San Diego Bay would also be inundated.

3. To compile demographic information for the SPF overflow area, it was necessary to select the census tracts in which it is contained. No census tract was selected for the overflow area east of Hilltop Drive because the area contains no structures. The part of the SPF overflow area from Hilltop Drive to 4th Street is contained within census tract 129. Census tract 131.01 contains the overflow area west of 4th Avenue. The ponding area behind Interstate 5 falls within census tract 126. Because parts of the census tracts are chosen to be fairly homogeneous in terms of their demographic characteristics, data for these census tracts should be representative of residences in the overflow area.

POPULATION

4. Current and projected population for the City and County of San Diego and National City and Chula Vista are shown on table B-4, Appendix B. The current figures are based on data on the average household size

for the relevant census tracts. Projections are based on San Diego Association of Governments (SANDAG) data on the expected change in household size.

FLOOD DAMAGES

5. No historical flood damage data at a level of detail suitable for estimating average annual flood damages for Telegraph Canyon Creek exist. What information is available is presented in the section titled "flood problem" under problems, needs, and opportunities, in the main report.

HISTORICAL LAND USE IN THE FLOOD PLAIN

6. In the absence of historical flood damage data, a detailed investigation of the historical pattern of development would be futile. It can be stated that the flood hazard was not recognized at the time that the area developed and that currently the majority of the flood plain residents do not seem to be aware of it. This may be at least partly explained by the fact that the severe flood hazard is probably a recent phenomenon. Development in the upper portion of the drainage basin, combined with the limited capacity of the Interstate 5 freeway culvert, are the principal factors in the flood problem. The area was extensively urbanized before the freeway and the upstream development were built. The expected increase in volume for given frequency large floods over the first 10 years of project life gives weight to the view that a substantial portion of the development in the flood plain occurred before a serious flood hazard existed.

LAND USE

7. Field studies and aerial photographs provided the data used to estimate the present land use in the overflow area. Future land use was projected in accordance with the Chula Vista General Plan 1990, modified by the assumptions regarding flood plain development mandated by the Flood Disaster Protection Act of 1973.

8. In view of the small amount of acreage that remains to be developed in the 100-year flood plain and the relatively flat topography of the area, any future development, if permitted, would direct floodflows into currently floodfree areas. The 100-year floodway was therefore considered to be identical to the 100-year flood plain. (No future development was projected in this area without a flood control project.) The standard project flood from Hilltop Drive to the bay would inundate 337 acres, of which 283 acres are currently urbanized. Downstream from 4th Avenue, there are currently 325 acres subject to flooding from the SPF flood. About 4 acres would be developed as a result of flood protection. An additional 9 acres could be developed even if no flood protection were provided. Table I-1 presents present (1983) number of units within the SPF overflow area and projected number of units by alternative.

9. To the north and south, adjacent land uses do not differ significantly from flood-plain lands. These areas are also highly developed in residential and associated commercial land uses. West of the main flood plains, there is an industrial strip between Interstate 5 and San Diego Bay. The moderately steep hillsides of upper Telegraph Canyon to the east are currently undeveloped but subdivisions have recently been approved for construction.

10. Development values. To determine the present value of property subject to flooding, an inventory was made. County tax assessor records were evaluated for 100 percent of the residential development. The data were adjusted to market values with the use of recent sales furnished by multiple real estate listings, providing the basis for estimating the value of residential structures. The contents of representative houses were evaluated. Insurance agents provided additional data based on their knowledge of amounts paid on claims for contents as percent total claims (content and structure). Base data were used to estimate residential content value. Commercial, industrial, and other developments were evaluated on an individual basis from field interviews. The Chula Vista General Plan 1990 and current zoning were used to project the mix of future development compatible with the projected. Average unit values of existing and projected development are displayed in table I-2.

UNIT DAMAGES

11. The absence of historic data made it impossible to determine historic unit damages for the flood plain. Therefore, these values were estimated by mathematically simulating various floods. The method was as follows:

(1) The number of units of each type of flood damageable property, together with its value, was inventoried by depth interval for each of the representative floods. This was supplemented with projections of units and values in the area between the limits of the standard project flood and 100-year flood plains.

(2) The above information was combined with data concerning the average proportion of damage for each development type by depth interval derived by the district from data gathered during flood damage surveys. This data was chosen to correspond as closely as possible to the projected flood situation in Telegraph Canyon in terms of hydrologic type and construction methods. These relationships are shown on table I-3.

(3) The combination of depth-damage relationships and unit values yielded unit damages for each flood. These values were held constant for structures for floods of less than 100-year magnitude but they vary over time in the standard project flood because of the projected change in land use. Table I-4 presents unit damages for the standard project flood. Table I-5 presents total flood damage for each selected flood.

(4) After the stream of damages for each selected flood was estimated, it was possible to combine these damages with the appropriate frequency curve for each alternative and for the base case. The resultant curves were integrated to provide an estimate of the probable annual damages over time. (See pls. I-1 and I-2 and tables I-6, I-7, and I-8.)

(5) The next step was to apply affluence factors to residential contents. These factors were derived from the OBERS Series E projected rate of increase in personal income per capita for San Diego County, 2.75 percent annually. Content values were not projected to increase past the point where they equalled seventy-five percent of the value of the corresponding structures.

(6) The final step was to subtract the damages that would remain (residual damages) for each plan from the flood damages in the base case to compute a stream of flood damages prevented. This stream was discounted by the current Water Resource Council formulation rate (7-7/8 percent) and amortized over the 100-year life of the project to compute equivalent annual benefits.

LOCATION BENEFITS

12. There is currently one vacant acre planned for low-density residential development and an additional three vacant acres planned for apartment development in the overflow area of Telegraph Canyon Creek between 4th Avenue and Interstate 5. Development could proceed in accordance with the adapted Chula Vista Plan under the project conditions.

13. Above 4th Avenue, there would be no location benefits for any alternative except Alternative B. The undeveloped land in this reach is not located near the channel.

14. The method used for estimating location benefits was the market value method.

15. In view of the small amount of land (4 acres) for which location benefits were calculated, the improvements that would be constructed under any plan were not considered to result in a significant addition to the supply of flood-free land. The market value of the land under the "with project" condition, minus its value under the "without project" condition, was therefore computed without adjustment as one measure of location benefits. A survey of recent land sales in the vicinity of the flood plain disclosed values averaging about $82,000 per acre. Recent sales of land in the flood plain overlay zone in Chula Vista were $10,000 per acre. The location benefits calculated on a 4-acre basis are: $82,000 - $10,000 = $72,000 per acre, $72,000 per acre x 4 acres = $288,000. The equivalent annual difference in land value (7-7/8 percent 100-year life) is $23,000.

16. Development in the location benefit area would be subject to damages from floods of greater than 100-year magnitude. Such damage was estimated using methodology identical to that which was used for estimating the residual flood damages from the recommended plan. These damages were estimated at $1,000 on an equivalent annual basis (7-7/8, 100-year); therefore, location benefits net of without damages are an estimated $22,000 on an equivalent annual basis.

BENEFITS FROM ADVANCE REPLACEMENT OF BRIDGES

17. Benefits would accrue from the advance replacement of bridges under each of the channel improvement plans. The following method was used to compute them. Data are for all structural plans. Three street bridges would require replacement to provide adequate clearance to accommodate design flood discharges. The bridges and their replacement would cost $380,000.

18. In the absence of a project, the existing bridges would need to be replaced in 1995. With the project, the new bridges will last for 50 years. The benefits were calculated as follows:

Annual value of bridges for 50-year period (based on cost)	=	$ 30,600
Present value of 40 years added bridge life in 1995	=	368,000
Present value of added bridge life in project year one (1985)	=	160,000
Equivalent annual value of added bridge life (7-7/8%, 100-Yrs)	=	12,600

COST SHARING

19. The local cooperation that would be required for the project is based on the Flood Control Act of 1936, as amended.

TABLE I-1 - Land use in Telegraph Canyon Creek flood plain (a)

PROPERTY TYPE	Existing (1983)	1985	1995	2005	2015	2025	2035	2085
Reach II - above 4th Avenue - all plans except Plan B								
Single-family residences	67	67	67	67	67	67	67	67
Schools (b)	1	1	1	1	1	1	1	1
Recreation (acres)	5	5	5	5	5	5	5	5
Reach II - above 4th Avenue - Plan B								
Single-family residences	67	82	82	82	82	82	82	82
Schools (b)	1	1	1	1	1	1	1	1
Recreation (acres)	5	5	5	5	5	5	5	5
Reach I - below 4th Avenue - Plans A-1 and A-2								
Single-family residences	283	288	298	298	298	298	298	298
Multifamily units	36	36	40	40	40	40	40	40
Commercial establishments	21	26	31	31	31	31	31	31
Mobile homes	16	16	16	16	16	16	16	16
Recreation (acres)	4	4	4	4	4	4	4	4
Reach I- below 4th Avenue - all plans except A-1 and A-2								
Single-family residences	283	298	313	313	313	313	313	313
Multifamily units	36	56	56	56	56	56	56	56
Commercial establishments	21	21	31	31	31	31	31	31
Mobile homes	16	16	16	16	16	16	16	16
Recreation (acres)	4	4	4	4	4	4	4	4
Ponding area								
Single-family residences	112	112	112	112	112	112	112	112
Multifamily units	116	116	116	116	116	116	116	116
Schools	1	1	1	1	1	1	1	1
Commercial	1	1	1	1	1	1	1	1

(a) A portion of this school is in Reach I - below 4th Avenue.

TABLE I-2 - Average unit values without affluence factors
Telegraph Canyon Creek
(in thousands of April, 1983 dollars)

Property type	Average unit value for existing development	Average unit value (1) for future development
Reach II - above 4th Avenue		
Single-family residences		
Structure	48,700	NA
Contents	23,900	NA
Contents as percent of structure	49%	NA
Reach I - below 4th Avenue		
Single family residence		
Structure	39,000	40,100
Contents	16,800	16,000
Contents as percent of structure	43%	40%
Apartment buildings (2)		
Structure	47,000	39,000
Contents	23,000	19,500
Contents as percent of structure	49%	50%
Commercial establishments	229,000	169,000
Schools	1,720,000	NA

Mobile homes - values were not determined because the structures would not experience significant flood damage.

Recreation - per acre damages were determined without reference to value.

(1) Future values are applicable only for those plans that would result in future development.

(2) First floor values only.

TABLE I-3 - Depth - Damage curves interval of one foot
(damage expressed as a percent of value)

Residential (Single and multifamily)	Depth	1	2	3	4	5
	Damage	.12	.17	.31	.34	.35
Residential contents (Single and multifamily)	Depth	1	2	3	4	5
	Damage	.34	.46	.58	.7	.8
Commercial	Depth	1	2	3	4	5
	Damage	.11	.22	.4	.52	.54
Industrial	Depth	1	2	3	4	5
	Damage	.1	.23	.38	.57	.68
Public	Depth	1	2	3	4	5
	Damage	.19	.27	.44	.46	.5

TABLE I-4 - Unit flood damages - Telegraph Canyon Creek
Standard Project Flood

	Existing 1983	1985	1995	2005	2015	2025	2035	2085
Reach II - above 4th Avenue								
Single-family residential								
Structure	7060	7060	7060	7060	7060	7060	7060	7060
Contents	5500	5810	7640	8270	8270	8270	8270	8270
Reach I - below 4th Avenue, except ponding area								
Single-family residential								
Structure	5280	5380	5440	5440	5440	5440	5440	5440
Contents	6310	6900	8950	11,740	12,120	12,120	12,120	12,120
Multifamily units								
Structure	6340	7870	8570	8570	8570	8570	8570	8570
Contents	9240	11,970	16,940	18,370	18,370	18,370	18,370	18,370
Commercial structures	40,520	34,770	30,820	30,820	30,820	30,820	30,820	30,820
Parks	4300	4300	4300	4300	4300	4300	4300	4300
Business and emergency costs, including channel restoration (total area)	51,600	51,600	51,600	51,600	51,600	51,600	51,600	51,600
Ponding area								
Single-family residential								
Structure	7520	7520	7520	7520	7520	7520	7520	7520
Contents	8920	9420	12,360	13,380	13,380	13,380	13,380	13,380
Multifamily units								
Structure	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200
Contents	8630	9100	11,940	15,670	18,490	18,490	18,490	18,490
Commercial	100,900	100,900	100,900	100,900	100,900	100,900	100,900	100,900
Schools	871,700	871,700	871,700	871,700	871,700	871,700	871,700	871,700

TABLE I-5 - Estimated damages resulting from floods of various magnitudes (in thousands of April, 1983 dollars)

	(Flood magnitude)	1983	1985	1995	2005	2015	2085
		Hilltop Drive to 4th Avenue					
	(3,850 cfs)						
Residential							
Structure		473	473	473	473	473	473
Contents		369	390	511	554	554	554
TOTAL	(3,850 cfs)	843	863	985	1027	1027	1027
TOTAL	(1,550 cfs)	499	511	578	609	609	609
TOTAL	(1,000 cfs)	418	428	486	505	505	505
		4th Avenue to I-5					
	(5,500 cfs)						
Residential (Single and Multifamily)							
Structure		1720	1834	1964	1964	1964	1964
Contents		2118	2385	3346	4235	4349	4349
Commercial		851	903	955	955	955	955
Public							
Parks and open space		17	17	17	17	17	17
Channels		14	14	14	14	14	14
Business and emergency		40	40	40	40	40	40
TOTAL	(5,500 cfs)	4760	5193	6338	7226	7454	7454
TOTAL	(2,800 cfs)	2056	2109	2422	2743	2782	2782
TOTAL	(1,700 cfs)	1468	1503	1718	1928	1953	1953
TOTAL	(1,450 cfs)	1418	1453	1656	1853	1876	1876
TOTAL	(1,000 cfs)	943	965	1093	1211	1223	1223
		Ponding area					
	(190 acre-feet)						
Residential (Single and Multifamily)							
Structure		2142	2142	2142	2142	2142	2142
Content		2000	2110	2770	3317	3644	3644
Commercial		100	100	100	100	100	100
Public		872	872	872	872	872	872
TOTAL		5114	5224	5884	6431	6758	6758
TOTAL	(87 Acre-Feet)	3118	3182	3558	3898	4111	4111
TOTAL	(62 Acre-Feet)	1870	1911	2149	2381	2535	2535

TABLE I-6

Estimated Average and Equivalent Annual Damages Without Project
(in thousands of April 1983 dollars)

HILLTOP DRIVE TO 4TH AVENUE

	1983	1985	1995	2005	2015	2025	2085	Equivalent Annual--7-7/8%, 100-Year
Residential								
Structures	27	27	38	38	38	38	28	30
Contents	20	22	40	42	42	42	42	29
Total	47	49	78	80	80	80	80	69

4TH AVENUE TO I-5

Residential								
Structures	85	85	115	115	115	115	115	112
Contents	87	96	170	208	210	210	210	122
Commercial	28	30	40	40	40	40	40	32
Public								
Parks & Open Space	*	*	*	*	*	*	*	*
Channels	*	*	*	*	*	*	*	*
Business and Emergency	2	2	2	2	2	2	2	2
Total	202	213	327	364	367	367	367	309

PONDING AREA

Residential								
Structures	40	40	50	50	50	50	50	41
Contents	38	40	67	80	88	88	88	49
Commercial	1	1	1	1	1	1	1	1
Public	19	19	24	24	24	24	24	22
Total	98	100	142	155	163	163	163	134

*Less than $500

TABLE I-7

Estimated Average and Equivalent Annual Damages
Remaining with Recommended Project
(in thousands of April, 1983 dollars)

HILLTOP DRIVE TO 4TH AVENUE

	1983	1985	1995	2005	2015	2025	2085	Equivalent Annual-- 7-7/8%, 100-Year
Residential								
Structures	1	1	1	1	1	1	1	1
Contents	1	1	1	2	2	2	2	2
Total	2	2	2	3	3	3	3	2

4TH AVENUE TO I-5

Residential								
Structures	6	6	7	7	7	7	7	7
Contents	6	7	11	15	15	15	15	9
Commercial	2	2	2	2	2	2	2	2
Public								
Parks & Open Space	-	-	-	-	-	-	-	-
Channels	-	-	-	-	-	-	-	-
Business and Emergency	-	-	-	-	-	-	-	-
Total	14	15	20	24	24	24	24	20

PONDING AREA

Residential								
Structures	8	8	10	10	10	10	10	9
Contents	8	8	14	16	17	17	17	10
Commercial	0	1	1	1	1	1	1	1
Public	3	3	5	5	5	5	5	5
Total	19	20	30	32	33	33	33	28

TABLE I-8

Estimated Average and Equivalent Annual Damages
Prevented by Recommended Project
(in thousands of April 1983 dollars)

HILLTOP DRIVE TO 4TH AVENUE

	1983	1985	1995	2005	2015	2025	2085	Equivalent Annual--7-7/8%, 100-Year
Residential								
Structures	26	26	37	37	37	37	37	39
Contents	19	21	39	40	40	40	40	27
Total	45	47	76	76	77	77	77	67

4TH AVENUE TO I-5

Residential								
Structures	79	79	108	108	108	108	108	105
Contents	81	89	159	193	195	195	195	113
Commercial	26	28	38	38	38	38	38	30
Public								
Parks & Open Space	*	*	*	*	*	*	*	*
Channels	*	*	*	*	*	*	*	*
Business and Emergency	2	2	2	2	2	2	2	2
Total	188	198	307	340	343	343	343	289

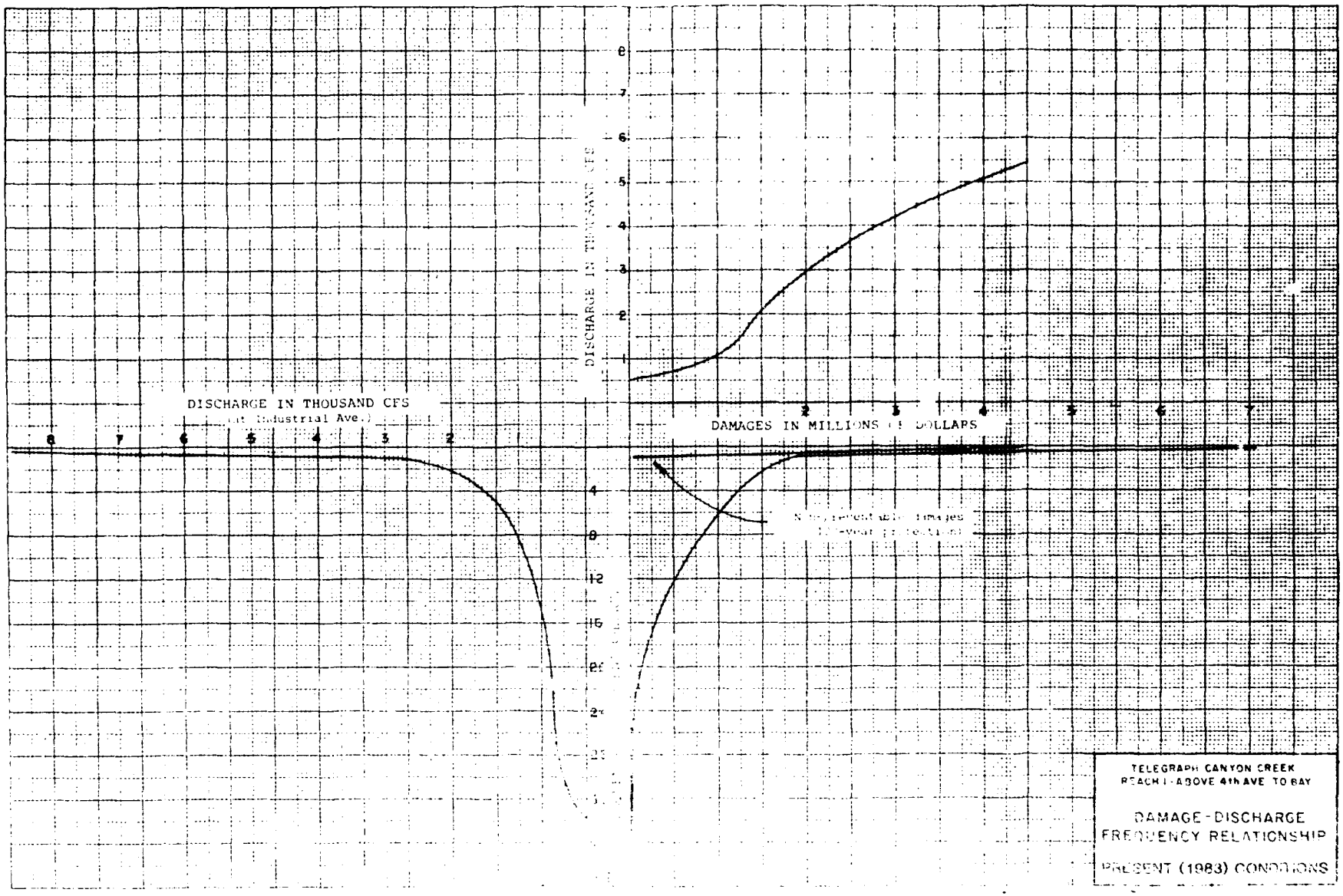
PONDING AREA

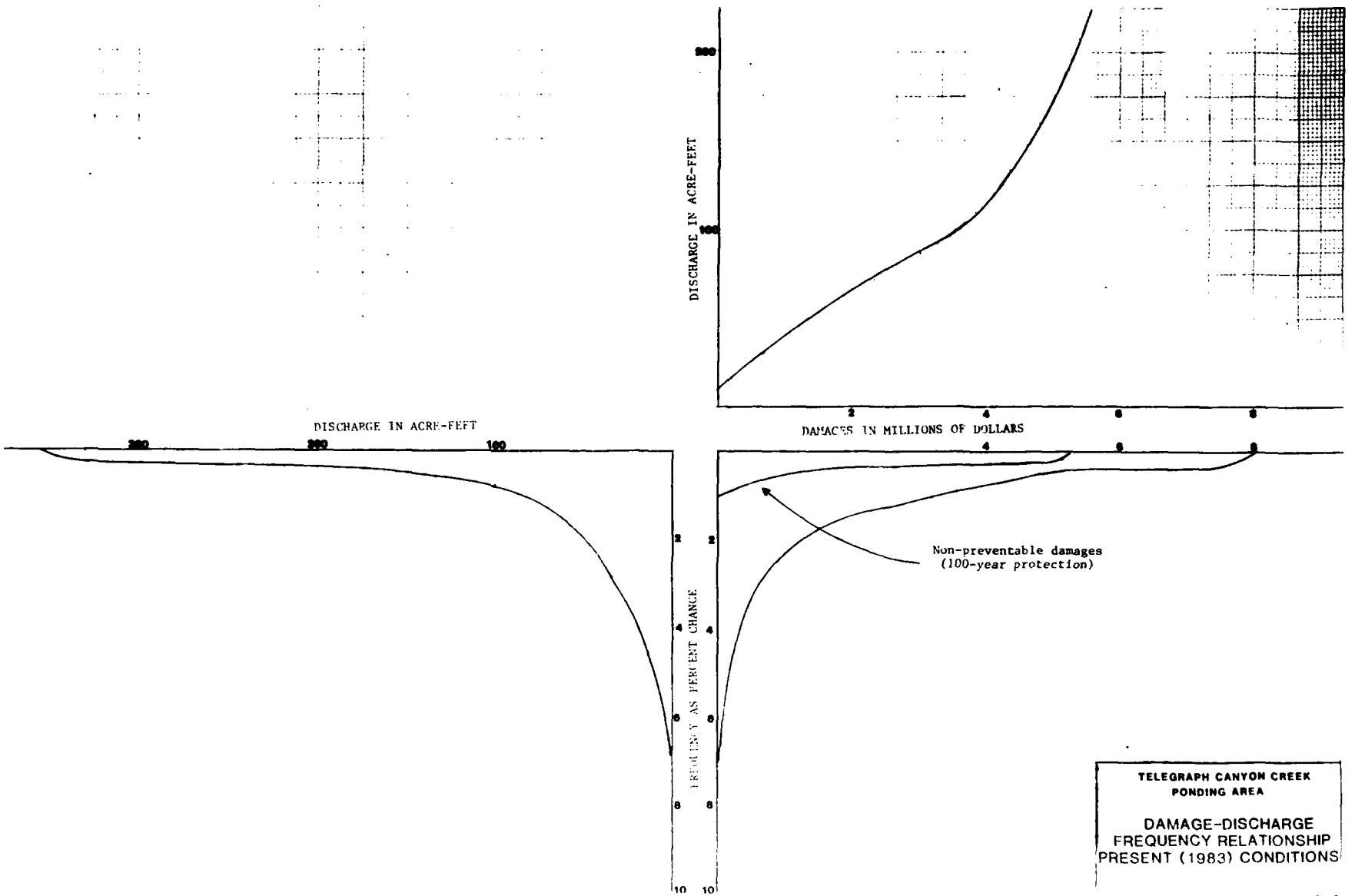
Residential								
Structures	32	32	40	40	40	40	40	32
Contents	30	32	53	64	71	71	71	39
Commercial	*	*	*	*	*	*	*	*
Public	16	16	19	19	19	19	19	18
Total	78	80	112	123	130	130	130	106

* Less than $500

TABLE 1-9
Economic Summary
(in thousands of April 1983 dollars)

	C-1	C-2	C-3	E	M
FIRST COSTS					
Construction	2,600	3,340	1,570	5,600	3,660
Relocations, bridges	430	430	1,200	430	410
Rights-of-way	630	770	2,590	1,080	820
TOTAL ANNUAL CHARGES	3,660	4,540	5,360	7,110	4,890
ANNUAL CHARGES					
Interest & Amortization	288	358	422	560	385
Operation, Maintenance & Repair	9	9	11	9	9
TOTAL ANNUAL CHARGES	297	367	433	569	394
ANNUAL BENEFITS					
Damages prevented	340	340	340	381	395
Location benefits	22	22	22	22	22
Advance replacement of bridges	13	13	13	13	13
TOTAL ANNUAL BENEFITS	375	375	375	416	430
B/C RATIO	1.3	1.02	0.9	0.7	1.1
NET BENEFITS	78	8	-58	-153	36


DISCHARGE IN THOUSAND CFS
DISCHARGE IN THOUSAND CFS
DAMAGES IN MILLIONS OF DOLLARS
TELEGRAPH CANYON CREEK
REACH I - ABOVE 4th AVE TO BAY
DAMAGE - DISCHARGE
FREQUENCY RELATIONSHIP
PRESENT (1983) CONDITIONS



TELEGRAPH CANYON CREEK
PONDING AREA

DAMAGE-DISCHARGE
FREQUENCY RELATIONSHIP
PRESENT (1983) CONDITIONS

PLATE I-2

END

FILMED

3-85

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